



FRIDAY, OCT. 6, 1893.

## CONTENTS.

ILLUSTRATIONS:	PAGE.		PAGE.
Rowell-Potter Automatic Block Signal System.....	729	Car Building.....	739
The Chicago Main Drainage Canal.....	730	Bridge Building.....	739
American Steel Bolster.....	733	Meetings and Announcements.....	739
CONTRIBUTIONS:		Personal.....	740
The Cooke Locomotives for Canada.....	737	Elections and Appointments.....	740
The Brake Beam Patents.....	737	Railroad Construction.....	740
EDITORIALS:		General Railroad News.....	742
Pulling and Starting Power of Electric and Steam Locomotives.....	734	Traffic.....	742
The Security of Postal Cars.....	735	MISCELLANEOUS:	
August Accidents.....	735	Technical.....	738
The Latest New York & New England Story.....	736	The Scrap Heap.....	738
Annual Report.....	736	The Standard Rail Sections.....	727
EDITORIAL NOTES.....	737	The Busk Tunnel.....	729
NEW PUBLICATIONS.....	737	Train Accidents in the United States in August.....	732
TRADE CATALOGUES.....	737	World's Fair Notes.....	733
GENERAL NEWS:		Lubrication of Cars.....	733
Locomotive Building.....	739	A Belgian Experiment in Fares.....	733
		Railroad Matters in Chicago.....	737

## Contributions.

## The Cooke Locomotives for Canada.

Canadian Locomotive and Engine Co., Ltd.,  
KINGSTON, ONT., Sept. 30, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to Mr. John Cooke's letter in your paper of Sept. 29, respecting the two locomotives ordered of them by the Dominion Government, we wish to state that, when tenders were called for in April last, we made an offer to build the engines and promised delivery by Aug. 1. We were informed by the Department of Railways and Canals that, as it was imperative the engines should be delivered by July 1, the order had been given to Messrs. Cooke. Messrs. Cooke, however, failed to deliver the engines until Sept. 10.

F. J. LEIGH, Superintendent.

## The Brake Beam Patents.

Chicago Railway Equipment Co.,  
CHICAGO, Sept. 29, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In view of the reports that have recently been industriously circulated, both through the press and by letter, relative to the patents of this company, we think an occasion exists for formally and fully advising you with reference thereto.

All of the patents owned or controlled by this company are foundation patents, there being no patents underlying them which can even be technically construed as having any prior claim. Therefore, any statement to the effect that the National hollow brake beam is an infringement of any patent is both misleading and false.

All of the brake beams sold by the American Brake Beam Co., to wit, the "Central," "Schoen," "Kewanee" and "Universal," are *prima facie* infringements of one or more patents owned or controlled by this company. In May last we filed a suit against these parties as infringers at Detroit, Mich., which suit is now pending, and it is our purpose to have all of these matters finally determined by the courts.

We have heretofore refrained from giving notice or undue publicity to these facts, preferring to litigate them directly and entirely with the manufacturers; but now we deem it both our duty and right to state that any brake beams purchased from the American Brake Beam Co. are *prima facie* infringements of our patents. The brake beams purchased from this company are not subject to any infringement claims by any one, and we not only assert this fact, but it may be verified by the railroad associations, and we fully guarantee every one against such claims.

With reference to the report circulated, as to an adverse decision recently rendered by the Examiner of Interference, the facts are as follows:

An interference suit has been pending for some months between Philip Hien and one W. A. Pungs, to determine the priority of invention of a special casting or fitting known as a "supplemental attaching block," the purpose of which casting being to enable the common brakehead (as made for a wooden beam) to be used on a metal beam. This form of casting is not used by any road, to any extent, except by the B. & O. (under the Kobischung patents), so that it is not a matter which in any way affects, or is connected with, the standard beams of this company as used by other roads throughout the country.

Hien filed his application for patent, claiming the broad ground for this casting in November, 1888; subsequently Kobischung improved upon Hien's invention and filed applications and received patents for his special forms in November and December, 1890, the numbers of which patents are 411,195 and 412,138. It was not until February, 1891, that Pungs filed his application for a patent, which showed a casting for similar purpose, and on Jan. 12, 1892, was granted a patent, the number of which is 466,834, the claim of which is for his special

and limited form of attaching block and it is limited to the particular form shown.

Hien's original application was allowed to lapse, pending the decision of other patent matters, and, through an oversight of his attorney in the meantime, Pungs' patent was issued. Hien filed a new application and forced an interference with Pungs, so as to determine the priority of invention, this being necessary in order to secure Hien the broad ground he had been claiming, Pungs having previously (through the lapse of the original application of Hien) received a patent for the specific claim, embodying the same invention.

The issue thus raised is, whether Hien is entitled to the broad claim, and through it subject Pungs' patent to its operation, or whether Pungs shall retain what he already claims, without being subjected to the Hien invention. It will thus be seen that Pungs is simply fighting to hold what he already claims, and a final decision in his favor will give him no other or greater rights than exemption from the domination of the Hien invention, and protection for his specific form. Below, the decision has been in favor of Pungs, and the case is now on appeal to the Commissioner of Patents. It is therefore premature for either party to advertise the primary decision, as the final decision is all that will prevail.

The American Brake Beam Co., to offset the disadvantage of the suit filed by this company in May last, caused a suit to be filed against the National Hollow Brake Beam Co., in July last, on this Pungs patent (466,834), the wording of the claim being such as to give them a technical excuse, and, by having it reported "The American Brake Beam Co. has sued the National Hollow Brake Beam Co. for infringement of patent," endeavored to get the benefit of what might be inferred by those unfamiliar with the facts.

It was not until after we had sued the Detroit people for infringement of our patents that they did what was only to be expected. We do not know how much good faith is in their suit, but ours will stay to a finish. We have felt no anxiety whatever over theirs, and do not expect to. Both will be pressed by us.

Regretting the apparent necessity of "a circular," but justifying it on the ground that "misrepresentation often repeated is too often believed," we make this statement of facts for your benefit, as well as our own.

CHICAGO RAILWAY EQUIPMENT CO.,

Lessee National Hollow Brake Beam Co.

## The Standard Rail Sections.

The June issue of the *Transactions* of the American Society of Civil Engineers contains the report of the Committee on Standard Rail Sections which was presented at the business meeting of the Annual Convention, Aug. 2, and which has already been published in the *Railroad Gazette*, Sept. 1, page 618. In addition to what was published there the *Transactions* contain replies from a number of railroad engineers to the letters of inquiry sent out by the Committee. These replies we summarize below. It must be borne in mind that they are about a year old, the dates running from Sept. 12 to Nov. 15, 1892.

E. H. McHENRY, Principal Assistant Engineer Northern Pacific Railroad, sends through Mr. J. W. Kendrick, Chief Engineer, tracings of 103 sections taken on the Logan-Butte Division of the Northern Pacific, and says it is hard to deduce any general conclusions from these sections. The wear is variable and without appreciable cause, being on light curves in many cases much greater than on sharper curves, and the reverse. This being a division of heavy grades the speeds up and down are quite different. He thinks that

"the correct method is to put up the curves for a speed very little in excess of that used by the ascending trains, and to hold down the speed on descending trains by strict orders, and, by proper supervision, to see that these orders are carried out. Apparently, the effect of elevating the outer rail too much would be in the direction of decreasing train resistance, as the centrifugal force would not then overbalance the tendency for the flanges to seek the lower rail, due to the effect of gravity. In practice, however, I am convinced that this does occur, and that the train resistance is actually increased. The car floors are no longer balanced, and an unequal proportion of the weight falls on the lower trucks, preventing them from conforming properly to the curve. This is especially noticeable when a train traverses a reversing curve. The trucks must then swing through a considerable arc in changing from the radical position they have assumed on one curve to a radial position on the opposing curve; and as this shifting is done under very unfavorable conditions, the weight being thrown upon one side instead of balanced at the center, it seems to cause considerable extra train resistance. Calculating this resistance by the decrease in train speed, in one case, I found it to be equivalent to an additional rise of 1.1 ft. in the length of the two curves. By a reversing curve I do not mean, of course, curves without a reversing tangent, but curves close enough together so that the train will be on both curves at the same time. In the particular case in point, I feel convinced that a large amount of the rail wear is owing to the undue elevation used."

It is particularly difficult to generalize from the sections as it is not at all certain that the wear shown is due to existing conditions. Wear on the inside of a low rail may have often been due to faulty section originally, and often to tight gauge. Indeed, he believes that excessive and unusual rail wear occurring locally is almost invariably due to tight gauge.

While the results presented do not seem to Mr. McHenry conclusive or very satisfactory, nothing has been found to change his opinion which is in favor of the use of sharp corner rails. The following extract we give in full as being novel and peculiarly interesting.

"I note Mr. Hunt asks for information regarding sharp wheel flanges, and particularly whether such flanges have been found on both wheels on the same axle. I feel that I am able to shed some light on this subject, and I do not remember ever having seen it noted in any of the various discussions regarding the proper

rail section. I wish to assert my belief that a large part of the excessive wear observed on both wheels and rails on new track is due to the chisel action of the sharp-cornered rail at the joint cutting the flanges of the wheels, and scoring them in such a manner that their reaction upon the rail is in turn equally destructive. In support of this I will point out the results obtained during the construction of some of our new lines. You will remember that at the time the Butte line was constructed we were much annoyed by the extraordinary flange wear on the engine drivers. The wear was abnormal and occurred on both wheels on the same axle alike. The principal wear was on the forward and rear driving wheels, the intermediate wheels, even if flanged, showing but very little wear. This might be expected, as the flanges on the intermediate wheels would rarely come in contact with the rail.

"This phenomenon bothered me greatly, and I made a large number of examinations with a view to determining the cause. During several track inspections I noted that the amount of new filings or chips of metal along the track were especially noticeable, indicating that the wear of the flanges and rails was excessive. This line of worn metal was continuous along the outside rail of every curve. The amount of filings was increased at the joint, some joints showing much more wear than others. It was noticeable that the filings increased in amount wherever the alignment between the ends of the adjacent rails was not perfect. Also, that where the expansion was insufficient, in addition to the alignment not being perfect, that the amount was increased. Where the expansion was too great, even a considerable offset did not produce similar results, as in the other cases. An inspection of the engine drivers showed that they were not worn smooth and bright as in ordinary practice, but were extremely rough, being scored or cut in very perceptible curves. The shape of these curves was that of a modified cycloid, showing the characteristic loop at the beginning of the reverse curve. This led to the conclusion that the extraordinary rate of wear was unquestionably due to the effect of the sharp corner at the end of the rail, which acted precisely as a sharp cutting tool in every case where there was not a perfect alignment. This perfect alignment it is practically impossible to secure in curving rails for very sharp curves, for obvious reasons. Acting upon this theory, I predicted that the excessive wear would disappear in time and become no longer noticeable, which has since proved true, and my theory has been demonstrated to be correct in a number of other cases.

"While this wear went on in the same manner in the case of rails laid on the main line it was not so noticeable, as the number of wheels that passed over the ground was very much greater, and the percentage of mileage run over the new steel was an insignificant proportion of the whole. In the case of our construction engines on the track laid entirely with new steel the result was different, as the mileage run was entirely upon new steel. The wear of the flanges due to this cause was not confined to the wheels alone; the engine flanges, being roughly scored, in turn wore the rails, and there was consequently, first, the action of the rail ends on the engine flanges, and second, the reaction of the roughened flanges against the rail throughout its length between the joints."

THOMAS RODD, Chief Engineer Pennsylvania Lines West of Pittsburgh Northwest System has had no personal experience with rails with sharp top corners, the Pennsylvania standard being large radius. Believes, however, that a sharper top corner than that used by the Pennsylvania Railroad, is desirable.

M. J. BECKER, Chief Engineer Pennsylvania Lines Southwest System, confirms his opinions as expressed four years ago (*Transactions* Vol. XXI, pp. 154 and 247), that is crown radius 12 in., corner radius  $\frac{1}{4}$  to  $\frac{1}{2}$  in.

I. S. P. WEEKS, Chief Engineer Burlington & Missouri River Railroad in Nebraska, laid about 100 miles of sharp corner rail on Deadwood Lines with curves as high as 16 degrees. The sharp corners both on curves and on tangents wore to a large radius of corner and flaring side, conforming somewhat to the shape of the wheel. After this wear had taken place, say after two years, train loads could be increased about  $\frac{1}{2}$ , also the wear of the car wheels was very materially diminished after the rail had worn to this shape. This test is conclusive that the section is entirely wrong. The section shown by Mr. Weeks has radius of corner  $\frac{1}{4}$  in., radius of crown 12 in., width of head 2 $\frac{1}{2}$  in.

CHARLES S. CHURCHILL, Engineer Maintenance of Way Norfolk & Western Railroad, has not had very direct experience with what are now called sharp top corners. The standard up to June, 1892, was the Pennsylvania Steel Company's section No. 2, the corners being  $\frac{1}{4}$  and  $\frac{1}{2}$ , crown radius 11 in. and 10 in., width of top 2 $\frac{1}{2}$  and 2 $\frac{3}{4}$ . These sections replaced in 1888 rails of various sections, but generally of  $\frac{1}{4}$  in. corner radius. On the main line, Norfolk to Bristol, with numerous curves varying from 4 degrees to 8 degrees, and on other divisions with curves as high as 12 degrees, it has been found that rails of these sections have been cut quite generally on the curves by the wheel flanges. Early in 1892 the decision was reached that any new section should have vertical sides and sharp top corner radius; further, that the width of the head should be somewhat greater relatively than that of the 67-lb. rail used between 1886 and June, 1892. The standard adopted in June for the sections of heavy traffic was 85 lbs., crown radius 12 in., corner radius  $\frac{1}{4}$  in., vertical sides, width of head 2 $\frac{1}{2}$  in. It is the opinion of the officers of the road that the sharp top corner radius of vertical sides postpone the flange wear against the rail.

J. D. HAWKS, Chief Engineer, Michigan Central.—In the last four years his road has laid 40,000 tons of 80-lb. rail with  $\frac{1}{4}$ -in. corner radius. It is perfectly satisfactory so far as the radius is concerned; he sees no reason for any larger one; has put down a few experimental rails with perfectly square top corners and flat tops; finds that carrying the idea to that excess will show no bad results.

H. BISSELL, Chief Engineer Boston & Maine, is now



laying a 75-lb. steel rail with what would be called sharp top corners, and thinks the flat top, sharp corner rail is the best, one reason being that there will be less hollow drivers.

CHARLES W. BUCHHOLZ, Civil Engineer New York, Lake Erie & Western.—An experience of three years with rails with a corner radius of  $\frac{1}{4}$  in. has been entirely satisfactory, has put down about 40,000 tons and heard no complaint about sharp flanges.

K. AUGST, Chief Engineer Duluth & Iron Range, is now using the Michigan Central pattern, having put down 4,500 tons. The opinion has been with him one of gradual growth from beveled to straight sides, and from  $\frac{1}{4}$ -in. radius to  $\frac{1}{2}$ -in. Can attest a notable decrease of sharp flanges, and the appearance of the rails corroborates this, the rail with straight sides being dull and almost rusty, the rail of large radius and beveled sides being bright on the corner and side. How much of this difference comes from the increased resistance of the wider and flatter head to lateral variations in the path of the wheels he cannot say, but there is less nosing of individual cars on the new rail. The new rail is 80 lbs. and the old 60 lbs.

P. D. FORD, Chief Engineer Long Island Railroad after 13 years' experience has adopted as standard  $\frac{1}{4}$ -in. top corner, 12-in. crown; has laid 5,000 tons at the time of writing.

A. KIMBALL, Assistant to President Chicago, Rock Island & Pacific, some years ago adopted the Lehigh Valley pattern 70-lb. rail, which is doing good service; cannot say whether another section would have been better.

THOMAS DUN, Chief Engineer Atchison, Topeka & Santa Fe, has never had any experience with rails of sharp top corners. The standard Santa Fe sections have  $\frac{1}{2}$ -in. radius. The 66-lb. section has been in use a year and a half and has given very good results. This section has  $\frac{1}{2}$ -in. corner radius, 15-in. crown radius, vertical sides, width of head 2 $\frac{1}{2}$  in.

E. P. HANNAFORD, Chief Engineer Grand Trunk, for many years has used a series of "Holley" patterns, and the result has been satisfactory. The crown radius is 12 in., corner radius  $\frac{1}{2}$  in., the head deep and narrow and sides flaring.

D. H. BRYANT, Chief Engineer Colorado Midland, is inclined to favor very strongly a rail like the D. & R. G. standard, namely,  $\frac{1}{2}$  corner radius, 12-in. crown radius, 2 $\frac{1}{2}$  in. width of head, sides sloping inward; can be no question that such a section will wear much longer on a curve than the Colorado Midland section 14-in. crown radius,  $\frac{1}{2}$  corner radius, 2 $\frac{1}{2}$  width of head, sides flaring out.

WALTER KATTE, Chief Engineer New York Central & Hudson River.—With the close of 1892 there will be nearly 100,000 tons of rails, 80 lbs. per yard, in the main passenger tracks, part of which is old metal, crown radius 12 in., corner radius  $\frac{1}{2}$ . This has been slightly revised, making total height 5 $\frac{1}{2}$  in., instead of 5, crown radius 14 in., corner radius  $\frac{1}{4}$  in. After considerable wear both sections seem to be very satisfactory. Mr. P. H. Dudley has furnished him results of examinations on other roads. On the Boston & Albany, with 17,000 tons of 95-lb. rail, head 3 in. wide, crown radius 14 in., corner radius  $\frac{1}{2}$  in., after 15 months' service the wheel flange contact on the inner side is from  $\frac{3}{8}$  to  $\frac{1}{2}$  in. in depth, or less than half that found on the 72-lb. rail, with head 2 $\frac{1}{2}$  in. wide,  $\frac{1}{2}$  in. corner radius. Both weights of rail have about the same inclination of side of head. Very little flow of metal on the 95-lb rail on the inside of the lower rails on curves. From observation on many lines, Mr. Dudley concludes that  $\frac{1}{2}$  in. is the best radius of corner for heads of 2 $\frac{1}{2}$  to 3 in. wide, and  $\frac{1}{4}$  in. for heads under 2 $\frac{1}{2}$  in. Under certain conditions there will always be some flow on inner edges, but it will be less with the sharper corners than with larger corners.

R. MONTFORT, Chief Engineer Louisville & Nashville, has laid and is laying a considerable amount of rail with 12-in. crown radius,  $\frac{1}{4}$ -in. corner radius and vertical sides. The rails laid in 1890 did not show satisfactory results, probably due in some degree to excessive wear of the corners resulting from the wheels being grooved by the old narrower headed rails, and due largely to an extraordinarily soft metal, in spite of the fact that the carbon averaged over .4. The rails laid in 1891 and 1892 gave much better results, doubtless because the grooves in the wheel have gradually worn to the new rail section, and also because of a better metal. He anticipates no further trouble. The Superintendent of Machinery watched closely the effect of sharp corners and new rails on the flanges. At first he thought that they had a marked effect on the leading wheels of the locomotives, but seldom found such effect on the car wheels. More recent observations have led to the conclusion that the sharp flanges caused by the  $\frac{1}{4}$ -in. radius are not of serious moment; is satisfied that when a similar section is generally adopted all objections to it will disappear.

WM. E. HOYT, Chief Engineer, Buffalo, Rochester & Pittsburgh, has laid some 5,000 tons of rails with sharp corner and finds them a great improvement over the old round corners. The radii are  $\frac{1}{2}$  in. for 70 lb. rail and  $\frac{1}{4}$  in. for 80 lb.

W. H. RUSSELL, Chief Engineer, Boston & Albany, has 150 miles of 72 lb. rail with a radius of  $\frac{1}{2}$ , which has given good service.

S. T. HOYT, JR., Engineer, Fall Brook Railway, has

used until this year the 76 lb. Lehigh Valley section with  $\frac{1}{4}$  in. corner radius. It has not given entire satisfaction, particularly on curves, where the outside rail wears away very much on the gaugeside, and the inside rail wears in spots along the top, giving it a wavy appearance. He had arrived at the conclusion that the softness of the head of this section was due principally to the fact that it contains a large percentage of metal; therefore in January of 1892 he adopted a 75 lb. section, almost identical with the section recommended by the Committee of the Society. At the time of writing he had laid about 2,000 tons of this, but it had been in service too short a time for any conclusions. The crown radius is 12 in.; corner radius,  $\frac{1}{4}$  in.; width of head, 2 $\frac{1}{2}$  in.

GEO. H. WEBSTER, Engineer Manitoba & Northwestern of Canada, has had experience only with a radius of  $\frac{1}{4}$  in., has in use 232 miles of such rail, has had immediate charge of track for 18 years with rails of this section, and when they are properly made and the track is kept in good order, they have given every satisfaction both as regards wear of rail and of wheel flange. He sees no reason to recommend a change.

GEO. M. BROWN, Superintendent of Roadway, Flint & Pere Marquette. His standard rail, which gives much satisfaction, has a corner radius of  $\frac{1}{2}$  and a crown radius of 14 in.,  $\frac{1}{4}$  in. wider at the bottom than at the top of the head. It gives much satisfaction; has in service 13,500 tons of this 65 lb. weight.

BLAIR BURWELL, JR., Chief Engineer, Florida Central & Peninsular. Of all the rails that he has tried he likes best his standard 58 lb. rail with  $\frac{1}{4}$  in. corner radius. His idea of a perfect rail is that it should be rolled right and left, the outside top corner rounded just enough to take off the sharp corner; the inside top corner to be  $\frac{1}{4}$  to  $\frac{1}{2}$  in., the sides of the head flaring out  $\frac{1}{8}$  in. from the vertical.

G. W. VAUGHN, Chief Engineer, New York, Chicago & St. Louis, has used for the last three years a 65-lb. rail, crown radius 12 in., corner radius  $\frac{1}{2}$ , angle of head 4 deg., flaring out. This has given better satisfaction than any other rail; has now in track 5,100 tons.

T. A. ALLEN, Chief Engineer, Evansville & Terre Haute, uses a rail with crown radius 15 in., top corner  $\frac{1}{2}$ , side angle 7 deg. This has given him the best satisfaction, and he believes it to be near what the standard should be. He is not in favor of extreme sharp corners or perpendicular sides, because the fillet and flanges of wheels must eventually wear the corner down to a radius of at least  $\frac{1}{2}$ ; nothing will be gained by having a smaller radius than that, or an inclination of less than 4 deg. A flat top would be very well for a new rail, but would certainly be worn to a curve soon.

A. S. CHEEVER, Chief Engineer, Fitchburg Railroad. The pattern of 1891 which he is using has a corner radius of  $\frac{1}{4}$  in., which is the shortest now in use by him; has now in track 7,737 tons 76-lb. rail with this radius and knows of no trouble from sharp flanges which could have been caused by it. On the old sections of larger corner radius the flanges cut into the rails on the outside of curves much faster than with the new section. Were he designing a new rail, he thinks he should use a  $\frac{1}{4}$ -in. corner radius.

R. D. MCCREARY, Chief Engineer, Western New York & Pennsylvania, has no rails with sharp corners; his standard is the Pennsylvania Steel Co.'s No. 2—that is 67 lbs., corner radius  $\frac{1}{2}$ , crown radius 11 in., side flaring out 5 deg. Experience with this has been satisfactory so far.

A. L. MILLS, Chief Engineer, Toledo, St. Louis & Kansas City, has found that the inside top corners of rails with  $\frac{1}{4}$  in. radius wear very rapidly on curves and make many sharp flanges, especially on steel tires. After the corners had worn to about  $\frac{1}{2}$  in. radius the wear was less rapid on both rails and wheels. The sharp corner is of short life. Experience with such rails and with rails of  $\frac{1}{2}$  in. corner radius has shown the latter to be more desirable; has put down about 12,000 tons of rails with  $\frac{1}{2}$  in. radius.

T. H. PERRY, Chief Engineer, Lake Erie & Western, has laid within the year 1,500 tons 75 lb., corner radius  $\frac{1}{4}$  in., breadth of head 2 $\frac{1}{2}$ , has noted the process of wearing very closely, especially for evidence of contact between flange and inside face of rail, but fails to discover any evidence of it. The wheels tread squarely on the top of the rail and the section promises the best results and he believes the  $\frac{1}{4}$  in. corner to be a decided improvement. The engineers think they can make better speed over this rail because of better traction on the broad top; he thinks that greater benefit is derived from the absence of flange friction.

E. A. HANDY, Chief Engineer, Lake Shore & Michigan Southern, has been using 65-lb. and 70-lb. steel since 1889, upper corner radius  $\frac{1}{2}$ , radius of crown 12 in., inclination of side of head 4 deg., and so far these sections have proved satisfactory.

W. H. BROWN, Chief Engineer, Pennsylvania Railroad the  $\frac{1}{2}$  in. radius for the corner of their 85 lb. rail was a compromise between the Engineer Department and the Motive Power Department; the Motive Power Department always insisted upon a  $\frac{1}{4}$ -in. radius, the Engineer Department very much preferred a  $\frac{1}{2}$ -in. radius. His own preference is a  $\frac{1}{4}$ -in. radius and vertical sides, but in that he was overruled, and the present standard was adopted, which he thinks is the best section they have ever had.

#### Rowell-Potter Automatic Block Signal System.

The object of the inventors in designing the safety stop and block signal system known as the Rowell-Potter Safety Stop was to provide a block system that would operate independently of the assistance of man so far as possible, and how well they have succeeded will be shown by the data to be given below. The serious nature of several recent collisions has drawn increased attention to the subject of signaling, and this apparatus will be of interest to those who believe in providing against even the remotest chances of error. As is well known, the most radical theory in this direction is that which provides for stopping a train even if the engine-man be asleep or dead, and the present installation merits attention as being one of the most extensive, embodying this theory, which has ever been put in use.

The mechanical appliances for a complete blocking system are shown in figs. 1, 2 and 3. Referring to fig. 1, at each signal station there are three bars, like detector bars, *H*, *G* and *M*, placed along the outside of the rail at proper distances apart, depending somewhat on the speed of trains. The middle bar, *G*, is placed close to the side of the rail so that when in its highest position it may be pressed down by the wheel tread of a passing train. The other two, *H* and *M*, are further out from the rail and so placed as to operate the device on the locomotive that applies the brakes when a danger signal is disregarded. The direction of the trains is indicated by the arrow in fig. 1.

The bar *G* is connected with a lever *S* which extends to the locking device at the side of the track; the lever is weighted near its outer end. Fig. 1a is a section on *B<sup>1</sup> B<sup>1</sup>*, showing the locking device; the outer end of lever *S* is connected with the notched standard *A*, so that when sufficient weight, as the weight of one wheel of a car, is on the bar *G*, the standard *A* is thrown up, and the pawl in the short end of the lever *B* engages in one of the notches in the standard *A*; the long end of lever *B* engages in the notch of the armature *D*, *C* being the magnet. The pipe shown in the lower part of fig. 1 forms a rigid connection between the locking device, the visual signal and the two bars *H* and *M*, that operate the air-valve on the locomotive.

The description will be better understood if an actual operation is explained. Suppose a train approaching from the left, in fig. 1, and the semaphore signal at safety, the bar *H* is in its lowest position and does not operate the air valve as the locomotive passes it; the bar *G* is in its highest position and the first wheel that passes over it depresses it, and it remains below the wheel tread till the clear signal is again given, the standard *A*, lever *B* and armature *D* taking the position shown in the section on *B<sup>1</sup> B<sup>1</sup>*. The weight *W<sup>2</sup>* is removed by means of the locking device from its contact with the pipe line, and weight *W<sup>1</sup>*, being double the weight *W*, the equilibrium is destroyed and the heavier weight *W<sup>1</sup>* throws the semaphore to the danger position, elevates bar *H* and depresses bar *M* and the train is not stopped. When the block is clear the lock allows *W<sup>2</sup>* to act with *W*, the two weighing more than *W<sup>1</sup>* the semaphore is thrown to the all-clear position, bar *H* is depressed and bar *M* elevated; the parts are again in position to be operated by a following train.

The device shown in fig. 2 is so arranged that when an attachment on the locomotive passes over it the circuit between it and the magnet *C* is completed, an electric current flows through the magnet, the armature *D* is attracted, the locking device is released and the "all clear" signal is given as described in the above paragraph. Let the station at which the magnet *C* is, be designated as No. 1 and the one next beyond it No. 2; the device shown in fig. 2 is placed at such a distance beyond station 2 that should the train be stopped at this device just after changing the signal at station 1 to "all clear," station 2 would stop a following train in the distance between station 2 and the delayed train. In steam railroad service this device would not be required as the signals would be operated by a track circuit.

In fig. 3 is shown the device that is attached to the locomotive, generally on the front bumper timber, for operating the air-brakes when an attempt is made to pass a danger signal. When the signal is at danger the bar *H*, fig. 1, is in its highest position, and the roller *R*, of the locomotive attachment, in rolling over the bar raises the vertical shaft *S*, and by means of a cam operates the air valve and opens communication between the trainpipe and the atmosphere, applying the brakes; to release the brakes the engineer must get down from the cab and close the valve by hand. If, on passing a signal station, the train does not set the signal at danger the bar *M* is in position to apply the brakes; after the engineer has released them he can proceed, but he knows that if he is stopped in that block he must protect his train by the Rowell-Potter portable track instrument. The device shown in fig. 3 is generally placed on both sides of the locomotive.

The drawings show the Rowell-Potter block signal system as designed for the Intramural Railway at Jackson Park, Chicago. This is the first road equipped with it, although the safety stop device for protecting switches and a tunnel, has been in use on the Boston, Revere Beach & Lynn Railroad for nearly two years. The signals on the Intramural were put in operation under permissive blocking on May 20 and under absolute

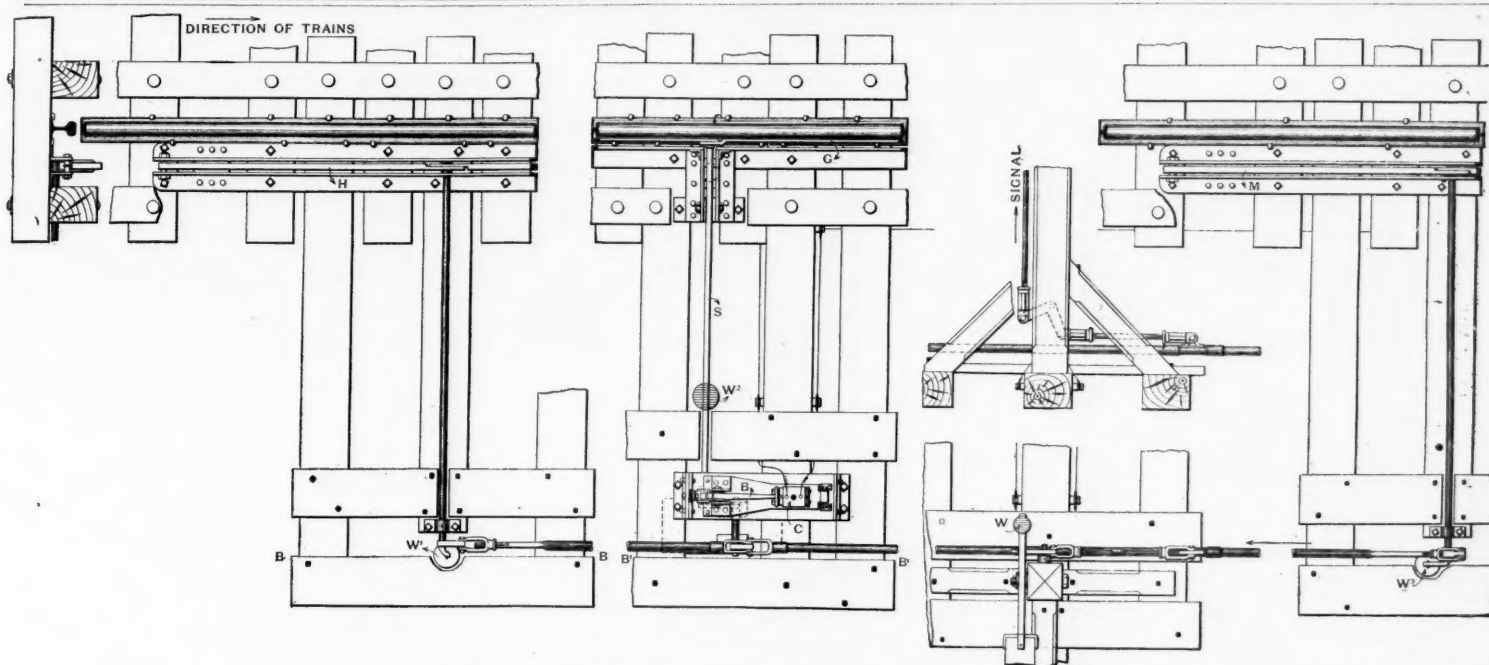


Fig. 1—The Rowell-Potter Automatic Block System, with Brake Applying Device.

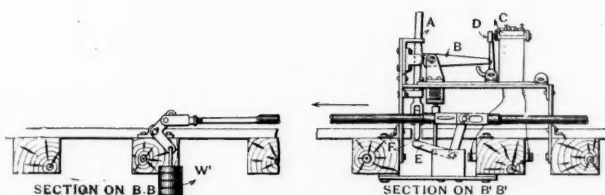


Fig. 1a—Detail of Fig. 1.

blocking on July 31 last, and the record between the latter date and Sept. 9 shows that there were 19 accidents to the system, 15 of which were electrical failures, in which the danger signal was given when there was no danger, simply indicating that the system was out of order; three were of a mechanical nature in which the visual signal, or semaphore, remained in the all-clear position when the train passed over the bar *G*, but the secondary bar, or incline, *M* stopped the train; the last was of a mechanical nature in which the semaphore remained at danger and the track instrument *H* would have stopped the train had the visual signal been disregarded. The road is equipped with 21 signals, and the signal movements per day average a total of 7,840, or about 266,560 movements between July 31 and Sept. 9. Some of the accidents were due to the peculiar conditions of the road and some to bad design of posts owing to lack of experience, this being the first plant; but, considering each a failure, and crediting the signals with the entire number of failures, 19, there was one failure in 14,029 movements.

The switches on the Intramural are interlocked with signals and track inclines, the latter similar to bars *H* and *M* in the illustration, so that if the switch is to be set for the siding the danger signal must be displayed before the switch is turned, and, also, the switch must be placed right before the clear signal is given. At the switch leading from the southbound track to the car house is placed a circuit breaker so connected with the block system that when a train is running into the siding the blocking system is not disturbed, but in passing from the siding to the main line the train comes under the protection of the blocking system as soon as it obstructs passage on the main line. On steam surface roads the switches on the main line would be made blocking stations.

The New York office of the Rowell-Potter Safety Stop Co. is at 117 Greene street, Jersey City, N. J. The General Western Agent of the company is Mr. C. H. Mecum, whose office is at 450 The Rookery, Chicago.

#### The Busk Tunnel.

It is claimed that the Busk tunnel will be in operation by Nov. 1. This enterprise has been carried on against the judgment of many experienced engineers and in spite of obstacles that have been met with from the inception of the project. One of the standing jokes made has been that the tunnel would make a good beer vault for Leadville, and by means of a pipe line the cooling draughts could constantly be had on tap in the great silver camp. But the company has continued its way against adverse criticism and many unexpected obstacles until the end is now close at hand and the enterprise is a demonstrated success. When this tunnel in the Continental Divide is completed, the Colorado Midland Railroad Company will have a tunnel for sale cheap, for the Hagerman tunnel now used will then be abandoned.

The Hagerman tunnel is 2,060 ft. long, located 70 ft. above the Busk tunnel, and is approached by a 160-ft. grade. Snow sheds built at great cost partially protect the long approaches, but owing to the heavy grade and

troubles from snow in winter time, the cost of operating the road has been very heavy. By the Busk tunnel seven miles distance will be saved and the ascent of 700 ft. avoided. More than this, the cost of maintenance of that particular piece of track has constantly been heavy. The Busk Tunnel Railroad Company placed its \$1,200,000 bonds in London at a good price, and will complete the enterprise within the estimates first made. The tunnel has been leased to the Colorado Midland for 999 years, and the lessee pays a rental of 25 cents per ton for all freight moved through the tunnel and the same amount for each passenger. It also pays for the maintenance of the tunnel and approaches.

The Busk tunnel is about 12 miles west of Leadville, Col., the eastern entrance being at Busk, on the Atlantic slope, at an elevation of 10,800 ft., and the western at Ivanhoe, on the Pacific slope, at an elevation of 10,932 ft. above the sea. The elevation at Ivanhoe is only 800 ft. above Leadville. The tunnel is 9,393 ft. or 1 7/8 miles long, 15 ft. wide and 21 ft. high. The grade in the tunnel is continuous from the Busk end, rising at the rate of 75 ft. to the mile, and the line is straight for the entire distance. This assures good ventilation and drainage without cost. No shaft has been sunk in the construction of the tunnel, the work being prosecuted from the two ends. In the progress of the work no trouble has been experienced in removing the under ground water from the Busk end, but at the Ivanhoe end it has been necessary to pump the water from the workings. For this purpose the company used three pumps, two of the Cameron make with a capacity of 100 and 200 gallons a minute, respectively, and one Duplex Deane pump with a capacity of 500 gallons a minute, the latter only being used in emergencies.

In operating through the tunnel coke will be used on the locomotives while ascending through from the Busk end, while trains going eastward will not require steam on account of the descending grade. The tunnel will be lighted by electricity by means of the same plant that has been used in the work of construction. Work has been continuous day and night from the start. The Ball system of electric lights has been used, both arc and incandescent lights having been furnished from the same wire.

Ground was broken for the approach cut at Ivanhoe, July 25, 1890, and work on the tunnel proper began Sept. 15 at the Busk end and Oct. 8 at the Ivanhoe end. On Sept. 12 last, at the Busk end, 4,953 ft. had been driven, at the Ivanhoe end 4,105 ft., leaving 330 ft. to be driven, which will require about a month. The engi-

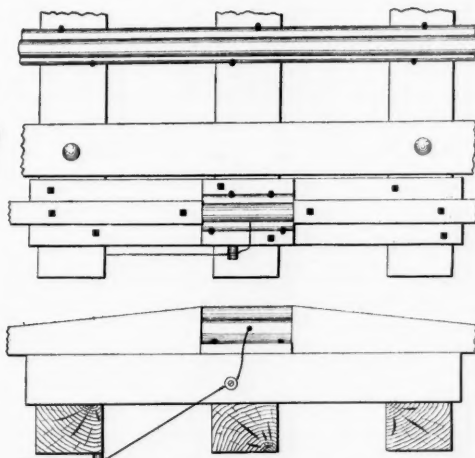


Fig. 2—Electrical Contact for Restoring Signal to Clear Position.

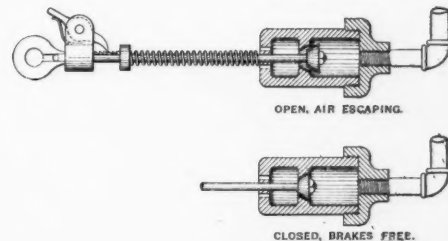


Fig. 3—Trip for Opening Air-Brake Valve.

neers are figuring upon making a record upon the accuracy of their measurements when the two ends meet.

Compressed air for the drills at Busk is furnished by two 20 x 24 in. Ingersoll straight line air compressors, and at Ivanhoe by a similar plant supplemented by a 20 x 24 in. Norwalk compressor and one small Ingersoll compressor, the additional power being required to run the pumps.

The Eclipse air drills are of the one-half size from the Ingersoll-Sargeant Rock Drill Company; they weigh about 420 lbs. exclusive of the tripods, and deliver 300 blows a minute, with a force of about 750 lbs. The rock in the heading is drilled, when comparatively soft, by two drills attached to two columns which are securely wedged between the rock of the tunnel roof and the floor of the heading. When the rock becomes dryer and harder four drills, mounted one above the other, on the same two columns, are necessary to drill the 20 to 24 holes required. These holes are sunk 12 ft. deep. The bench requires usually 12 holes. Three holes are drilled on each side of the tunnel center, being pointed horizontally toward the center line of the tunnel, and when the charges of giant powder are exploded, a wedge-shaped piece of rock is thrown out from the center of the bench. After this the powder from the three remaining holes on each side is exploded, and the remaining rock broken to the sides of the tunnel.

Fresh air is supplied to the men at the headings through a 14-in. galvanized iron pipe, the supply being independent of the air drill supply. It is forced in by a No. 6 Baker's blower supplying 5,000 cu. ft. of air per minute.

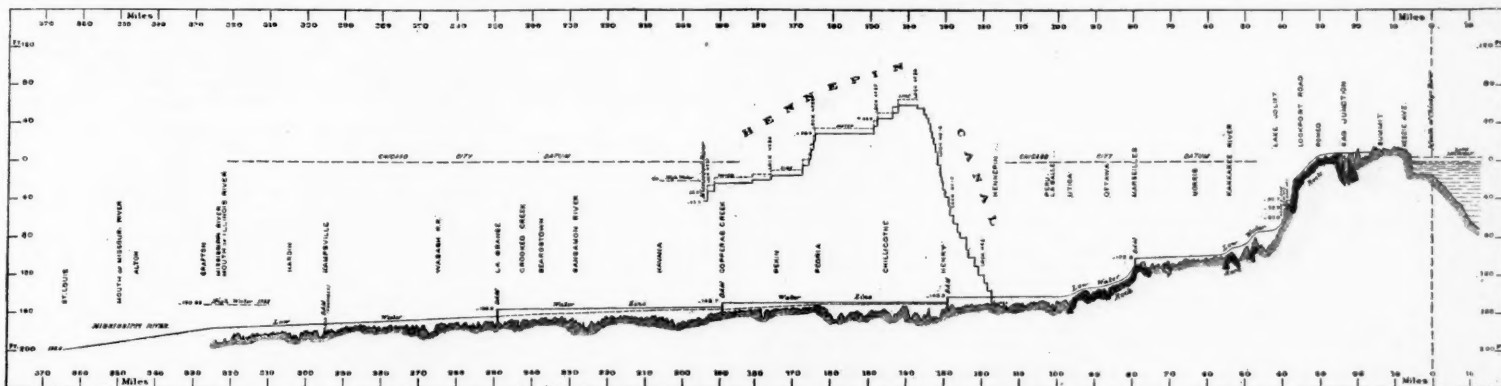
Débris from the workings is shoveled and wheeled to dump cars, which are hauled out by a small locomotive of a 20-in. gauge, made by H. K. Porter, of Pittsburgh. Coke is used for fuel, and the Colorado coke is devoid of sulphur.

Where the rock is solid the section of the tunnel is a gothic arch; where it is less stable, timbers 12 in. square are used to hold the rock in place, they being cut to form a five segment arch resting upon a wall plate and



The broken rock, as mentioned, is sent to waste alongside the canal by derricks, the principal dimensions of which are shown in the illustrations. It is understood that wasting the rock is sublet to the Brown Hoisting





Profile, Lake Michigan to the Mississippi River through the Illinois River Basin.

& Conveying Machine Company, of Cleveland, O., who build and operate the derricks, for about 15 cents per cubic yard, the contractor loading, hooking on and unhooking the kibles. The Brown company has built a track along the canal, as shown in the cut (see page 732), on which 11 machines are now at work. These machines traverse the track parallel to the canal at the general speed of 150 to 200 ft. per minute. While the visiting engineers were there they made a speed of about 350 ft. per minute. The capacity of the buckets is 75 cu. ft. when even full, and when heaped the load may be 9,000 or 10,000 lbs. The guaranteed capacity is 25 round trips per hour, discharging 88 tons on the waste pile. For a whole day an average of 32 trips per hour has been made, or, say, 900 cubic yards per day. The engines have double cylinders 10½ by 12 in., with patent band friction clutches, and are operated by three levers, one for hoisting, one for the travel of the kibble on the cantilever and one for the travel of machine on the tracks. It is expected that the tracks and some of the derricks will be employed in loading the wasted rock for use in and about Chicago when the canal is completed.

**History and Scope of the Work.**—This work, which is probably of much more importance to this country than the Manchester Ship Canal is to Great Britain, has proceeded under a law of the State of Illinois, providing for the sanitary requirements of Chicago, without attracting much more than local attention. And even those who think they know about it are apt to confound it with a projected pair of hydraulic staircases of inefficient dimensions connecting the Mississippi River at Rock Island with the Illinois at Hennepin. A large portion of the local attention has been from those who thought that an addition of 10,000 to 15,000 cu. ft. of water per second to the Illinois would be detrimental to its navigation. A government engineer saying of this projected flow, "it will then be time for its officers to abate the nuisance at public expense."

The law under which this improvement is being made is greatly due to the foresight and persistence of L. E. Cooley, C. E., now one of the Trustees, and was passed by the Legislature of Illinois in May, 1839. It provided for the erection of sanitary districts on the affirmative ballot of legal voters and the election of nine Trustees who shall constitute a board with duties and powers. Among these are to raise money by borrowing and direct taxation; to condemn, purchase and sell real estate, assess damages and benefits and let contracts. The act also provides that any channel constructed to discharge sewage into any river shall be of sufficient size and capacity to produce a continuous flow of water of at least 200 cu. ft. per minute for each 1,000 of the population of the district. In the specific case of the channel between Lake Michigan and the Illinois River, it is provided that through the rock the channel shall be not less than 160 ft. wide, and capable of producing not less than 18 ft. of water, and for each 100,000 inhabitants the channel shall pass 20,000 cu. ft. of water per minute, with a flow of not more than three miles per hour. The Trustees are also directed to remove the two dams in the Illinois River built by the state at Henry and Coperas creeks, before any water is turned into their channels, and they may remove any other obstructions, e. g., the government dam at La Grange and the foundation of the one commenced at Kampsville.

The Trustees of the Chicago Sanitary District, authorized by the above-mentioned law and aided in their efforts at National benefaction by vigorous demands that the Chicago sewage shall be thoroughly diluted, demands issuing from communities as far down the valley as St. Louis, are constructing a channel that will add 1,000,000 cu. ft. of clear water per minute to the Mississippi. At St. Louis this will amount to over 26 per cent. of the low water flow. This, it is estimated, will give a minimum depth there of 10 to 11 ft., with 14 ft. for about nine months of the year. In the Illinois, on the removal of the state and National dams, above referred to, the natural depth of the river will be 7 or 8 ft. and some dredging will give 14 ft., as in the Mississippi. There will then remain about 60 miles to be improved between Joliet and La Salle, with a fall of 141 ft. from Lake Michigan to the last mentioned place, before some 1,300 or 1,400 miles of 20-ft. navigation on the lakes is connected with the 15,000 miles of navigable water-courses in the Mississippi valley.

**Some of the Results.**—The advantages to the

people living on the 1,600 miles from Chicago to the Gulf will be almost incalculable. The contribution to the wealth of this locality may be partly measured by the estimate in the "Report on the Internal Commerce of the United States for 1891," that the saving to the public by water transportation on the entire traffic of the lakes during 1890 was \$135,000,000. This immense sum, equivalent to a dividend of over 68 per cent. on the gross expenditures by the general government on all rivers and harbors up to that time, must have been distributed between the producers who shipped via the lake route and their customers, for any charge for transportation must come out of either the producer or consumer. And as the freight charges by the lake route were about 6½ per cent. of the value of goods shipped, whereas, if shipped an equal distance by rail, the cost would have been 46 per cent. of such value, the low

cover the route with manufacturing towns, which have always been located on lines of least resistance, in time and money, to transportation. The consumption of these towns will change the population of the Mississippi valley from "the hewers of wood and drawers of water" for distant consumers to suppliers of the wants of nearby customers, and bring the average consumption per capita up to that of the North. Incidentally Chicago, which in 1859 Horace Greely ventured to predict would contain a million inhabitants within the life of some child then born, will become the largest city on this continent.

**The Effect on New York.**—The question of interest to the country is, What will New York and the Atlantic coast do with the now certain 20 ft. of water in the lake channels; with the now certain 24 ft. of water in Chicago harbor and 40 miles beyond, and with the probable near-by 14-ft. navigation to the Gulf? We have seen the inhabitants and business interests of the Hudson River valley from Lansingburg and Cohoes to Hudson, sit contented under the official information that their interests are not worth over 12 ft. of water, when Montreal, for some time, has had 27½ ft., through the successful efforts of John Kennedy, C. E. Will the educated East accept such professional advice as that given to the Albanians and Trojans and adopt the effect of the efforts of "the Union for the Improvement of the Canals of the State of New York" to limit the depth of the Erie Canal to 7 or 8 ft., or will they see that the Erie Canal is made fit to carry an annual traffic of 20,000,000 tons with expedition and safety, and procure such further deepening of the lake channels as will force Chicago to dredge an additional 3 ft. out of its proposed 10-mile harbor in the clay? This would undoubtedly retain the cheapest freight route where it now is.

New York is blessed by nature with the best position for a commercial city. It is a port of call, near the sea. It has one river from Troy in the north and another extending east as far as Providence. The presence of De Witt Clinton forced the Erie Canal on it, against its wishes. These advantages have made it the largest manufacturing city in the world. The value of the goods manufactured in the city during the census year lacked only 3½ per cent. of being equal to that of all the imports into this country that year; those of New York and Brooklyn exceeded the value of the total imports by over 30 per cent. The market offered by the manufacturing population of these two cities to our farmers exceeds in value that afforded by all the world outside the United States. Naturally, both exports and imports follow the route of the largest market.

While the topographical advantages of New York will remain, the possession of the cheapest line of transport may easily pass from her. This was greatly impaired when the average weight of locomotives exceeded 30 tons, and a six-foot canal has no economic excuse for being when 70-ton locomotives run parallel to it. It then merely teases the railroads without aiding them in the development of traffic. The pre-eminence in manufacturing and commerce, while to a great extent interdependent, are both controlled by the cost of transportation. As this is relatively increased to a locality, both its commerce and industry will pass.

New York in this emergency should not turn its attention to preventing the development of other parts of our country, as in the past; for in such cases as pointed out by Warner Miller, when Senator, the other locality gets the appropriation and New York gets left. Like that of the whole country, the prosperity of New York lies in the possession of the most economical routes possible for assembling the raw materials for manufacture and consumption and for distributing the finished products; savings in the cost of transportation constituting a dividend on business payable to both producers and consumers, which will be applied to increased production and consumption.

The distance through the State of New York and the lakes to Chicago is in round numbers 1,500 miles, and from Chicago to New Orleans it is 1,600 miles, or 3,100 miles in the aggregate. There is in this country capital and water enough, and, I trust, sufficient engineering skill, to make a waterway carrying 27 ft. to Chicago, and 20 ft. from there to the Gulf of Mexico. As the reduction of railroad freights in this country from about four cents per ton-mile in 1865 to less than one cent in 1890 so increased the amount of freight offered that the reduction



General Plan of the Waterway from Chicago to Cairo.

freight rates by water must have been the governing factor in the production of a large part of the goods shipped. It is this production which has filled up the Northwest with inhabitants and railroad lines.

The influence of deep water channels on population, and population is a fair index to prosperity, may be seen from a comparison of the inhabitants of four lake and four river cities. Up to 1858 the maximum governing depth between Chicago and Buffalo was 9½ ft.; to 1871 it was 12 ft., and from that to 1874 it was 13 ft., and has been 16 ft. since. In 1870 the aggregate population of Buffalo, Cleveland, Detroit and Chicago, the four largest cities, was 539,107; in 1890 the aggregate was 1,822,743, a gain of 209 per cent. In the Mississippi valley, where there has been no noticeable improvement in the rivers, the total population of St. Louis, Cincinnati, Louisville and New Orleans, the four largest cities, was 819,269 in 1870, and in 1890 the total was 1,150,153, a gain of 40½ per cent. There seems no reason to doubt that the prosperity born of a 14-ft. channel from Chicago to New Orleans, open nine months of the year, will justify a demand for a 20-ft. channel for the entire distance—a depth within the available resources. This depth (which would give Chicago control of the commerce of the north coast of South America), drawing freight from Buffalo on the one hand and Duluth on the other, will

did not sensibly decrease the net earnings of our railroads, but on the trunk lines have actually resulted in an increase of net earnings, I think it safe to say that no interests, except that of elevator owners in Buffalo, would be injured by the economies in transportation

tor was injured. It is said that conflicting orders were given.

26th, on New York Central & Hudson River, near Dykeman's, N. Y., butting collision between north bound passenger train No. 13 and south bound passenger train No. 20, making a bad wreck. Both engineers, both fire-

men, the engine of a passenger train was precipitated into a creek by the failure of a trestle which had been weakened by a freshet. The train was running slowly and the cars stopped short of the break in the track. The engine fell about 50 ft., and the engine man and fireman went down with it, but escaped without serious injury.

And 9 others on 9 roads, involving 4 passenger and 5 freight and other trains.

#### DEFECTS OF EQUIPMENT.

2d, on Southern Pacific, near China Grove, Tex., a freight train was derailed by the dropping of a brake rod; 1 tramp was killed and 1 injured.

10th, on Texas & Pacific, near Bonham, Tex., a freight train was derailed by a broken wheel, when on a trestle bridge, and 9 cars fell about 20 ft. A tramp was injured.

16th, on Savannah, Florida & Western, near Lakeland, Fla., the boiler of the locomotive of a freight train exploded while the train was running at considerable speed and the engine and 24 cars were piled up in a bad wreck. The engineer and fireman were injured.

17th, 3 a. m., on Cincinnati, New Orleans & Texas Pacific, near High Bridge, Ky., a car in a freight train was derailed by the pulling out of a Master Car-Builder's drawbar.

22d, on New Orleans & Northeastern, near Enterprise, Miss., a freight train was derailed by a drawhead, which broke and fell upon the track and 10 cars were derailed.

And 13 others on 11 roads, involving 2 passenger and 11 freight and other trains.

#### NEGLIGENCE IN OPERATING.

12th, 9 p. m., on Southern Pacific, at Port Costa, Cal., a freight train running upon the ferryboat "Solano" was not properly controlled and the engine ran off the end of the boat and fell, headforemost, into the mud at the bottom of the river.

19th, 5 a. m., on Chicago Great Western, at Valeria, Ia., a passenger train was derailed at a misplaced switch and three cars were overturned; 3 trainmen and 1 passenger injured.

25th, on Baltimore & Ohio, at Marshallton, Del., a heavy freight train ascending a grade broke apart between the tender and first car and all the cars ran back some distance to a private side track where they crushed a building and killed a man inside of it. Six cars were wrecked.

31st, 12:30 p. m., on Boston & Albany, near Chester, Mass., eastbound passenger train No. 16 broke through Willcutt's bridge, and 9 passengers and 5 trainmen were killed and 25 passengers and 2 trainmen were injured. One of the injured passengers died Sept. 26. The engine crossed the bridge and fell down the bank on the east side. The tender and first four cars, heavy Wagner cars, fell into the Westfield River, 20 ft. below, and three passenger cars remained on the west bank. The bridge was undergoing repairs and too many rivets had been taken out. This accident was reported in the *Railroad Gazette* of Sept. 8, 15 and 29.

And 3 others on 3 roads, involving 1 passenger and 2 other trains.

#### UNFORESEEN OBSTRUCTIONS.

4th, on Southern Pacific, near Soda Springs, Cal., a fruit train ran over a cow in a snowshed, and 7 cars were derailed. The road was blocked for about ten hours.

20th, on Atchison, Topeka & Santa Fe, at Willow Springs, Ill., a passenger train was derailed by running over a cow, the engine was overturned, and the baggage car derailed. The engineer and fireman were injured.

30th, on Western New York & Pennsylvania, near Tuscarora, N. Y., a passenger train was derailed at a washout. The engine was overturned, and one car badly damaged. Four trainmen and 1 passenger were injured.

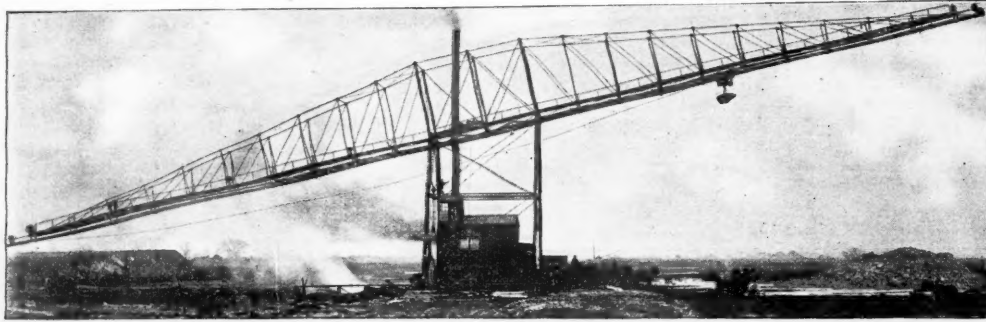
31st, on International & Great Northern, near Houston, Tex., a passenger train was derailed by a loose rail, and ran across a bridge on the sleepers. The engine and first car were overturned after crossing the bridge; engineer and fireman injured. It is said that the rail was maliciously loosened.

31st, on Atchison, Topeka & Santa Fe, near Brenham, Tex., a freight train was derailed at a point where the sleepers had been burned by a prairie fire, and several of the cars fell into a creek. The engineer and 2 tramps were killed and the fireman and 1 brakeman fatally injured. A part of the wreck was burned up.

And 6 others on 6 roads, involving 6 freight and other trains.

#### UNEXPLAINED.

3d, on Bellaire, Zanesville & Cincinnati, at Summer field, O., the caboose of a local freight train was derailed



The Brown Patent Balanced Cantilever Derrick.

In use on the CHICAGO MAIN DRAINAGE CANAL—THE BROWN HOISTING & CONVEYING MACHINE CO., CLEVELAND, O.

Height above ground, lower end, 20 ft.; upper end, 94 ft.  
Total length of cantilever, 355 ft.  
Working capacity of machine, 120 tons loose rock per hour.

Capacity of bucket, 75 cu. ft.  
Speed of travel of entire structure on tracks, 150 to 400 ft. per minute.

effected by this great internal route. In the meantime, from 1865 to 1890, we have passed in rank from the third to the first manufacturing nation, and our total foreign commerce has increased from 405 million to 1,647 million dollars.

#### Train Accidents in the United States in August.

##### COLLISIONS.

##### REAR.

2d, on Atchison, Topeka & Santa Fe, at Nickerson, Kan., a passenger train approaching the station ran some distance beyond the platform and struck a locomotive standing on the main track, badly damaging the engines. A boy was killed. It is said that the airbrakes failed to work.

2d, on Atchison, Topeka & Santa Fe, at Kinsman, Ill., a freight train running at considerable speed ran over a misplaced switch and into some cars standing on the side track, wrecking 18 cars and killing a large number of cattle. The wreck took fire and was burned up, together with the station and a grain warehouse. A tramp was killed and the fireman and a carpenter were injured.

4th, 1 a. m., on Central of Georgia, at Avondale, Ala., a passenger train ran into some freight cars which had been left standing on the main track, making a bad wreck; engineer, fireman and mail clerk injured.

5th, on Cleveland, Cincinnati, Chicago & St. Louis, at Danville, Ill., a freight train ascending a grade broke in two and the rear portion ran back a short distance to the bridge over the North Fork River, where it was stopped. While the cars were standing there they were run into by a following freight which approached at considerable speed. The collision was violent and knocked down the bridge, and the engine, caboose and 33 loaded freight cars fell into the stream about 60 ft. below. Two spans of the bridge were wrecked; one brakeman and three tramps were killed.

10th, on Philadelphia & Reading, at Barnitz, Pa., a work train ran into the rear of a preceding freight train, making a considerable wreck and injuring the conductor of the freight.

12th, on Lehigh & Hudson, near Belvidere, N. J., a freight train was struck by the rear cars of a preceding freight, which had broken in two, making a bad wreck and badly damaging the station building. Two employees were injured.

16th, on Central of New Jersey, at North Branch, N. J., a freight train descending a grade broke in two and the rear portion afterward ran into the front one, wrecking 5 cars. Nitric acid in one of the cars set fire to the wreck and a large portion of it was burned up. Two employees and a drunken tramp were burned by the acid, the latter badly.

16th, 4 a. m., on Chesapeake & Ohio, near Barboursville, W. Va., a freight train ran into the rear of a preceding freight which had been stopped on account of a broken coupling; engineer, fireman and one other man injured.

22d, on Philadelphia, Wilmington & Baltimore, at Middletown, Del., a peach train was run into at the rear by a following peach train and the engine and 7 cars wrecked. The engineer was injured.

26th, 11:47 p. m., on Long Island road, near Long Island City, N. Y., a passenger train moving about 5 miles an hour was run into at the rear by a following passenger train running at high speed, making a very bad wreck. Ten passengers were killed, 5 fatally injured and 22 less severely hurt and one brakeman was killed. The foremost train had been delayed in starting after being stopped at a block signal, the grade being ascending and the track slippery, and the signalman gave permission for the following train to enter the block section, which was about 4,000 ft. long, before the first train had cleared it. This accident was reported in the *Railroad Gazette* of Sept. 1 and Sept. 8.

31st, on Baltimore & Ohio, at Baltimore, Md., a freight train which had been stopped on account of the explosion of the cylinders of the locomotive was run into at the rear by a following freight, overturning the tender and fatally injuring a bystander.

And 12 others on 10 roads, involving 5 passenger and 14 freight and other trains.

##### BUTTING.

12th, on New York, Ontario & Western near Cornwall, N. Y., butting collision of freight trains, badly damaging both engines and several cars. A tramp was injured.

13th, on Pennsylvania road at Honey Brook, Pa., butting collision of passenger trains, injuring one brakeman.

17th, 3 a. m., on Chicago, Milwaukee & St. Paul, near Dubuque, Ia., butting collision between a passenger train and a freight, the passenger engine and two of its cars falling down a bank. Twelve passengers were injured.

23d, 1 a. m., on New York & New England, near Willimantic, Conn., butting collision of freight trains, badly damaging both engines and several cars. One conduc-

men and 1 passenger were killed, and 8 employees and 6 passengers injured. A telegraphic order making a meeting place for these trains was delivered to the south bound train reading "Dykeman's," and to the north bound train reading "Ice Pond."

30th, on Chicago, Milwaukee & St. Paul, at Elk River Junction, Ia., collision between a passenger train and a freight, badly damaging both engines and a mail car. Two trainmen and 3 passengers were injured.

30th, on Delaware & Hudson, near Worcester, N. Y., butting collision of freight trains, wrecking 3 engines and 12 cars. One engineer was injured.

And 5 others on 5 roads, involving 5 passenger and 5 freight and other trains.

#### CROSSING AND MISCELLANEOUS.

2nd, on Baltimore & Ohio, at Frederick, Md., a car in the freight yard became unmanageable and ran down a grade some distance on the main track until it met an engine and several passenger cars with which it collided, doing considerable damage. Two employees were injured.

15th, 3 a. m., on Great Northern, at Fergus Falls, Minn., a freight train which was to be passed by a passenger train running in the same direction was too long for the side track and the front portion was left standing on the main track, part of the train being on the bridge across the Red River. The passenger train came on at considerable speed and struck the freight cars at the fouling point, eight freight cars and the passenger engine being thrown into the river. The bridge was wrecked so that it fell. The passenger engineer was injured.

17th, on Illinois Central, at 115th street, Chicago, collision between a passenger train and a yard engine, injuring one conductor and one engineer.

20th, on Pennsylvania road, at West Philadelphia, a collision of freight engines resulted in the injury of 3 employees.

23d, 1 a. m., on Philadelphia, Wilmington & Baltimore, at Porter, Del., passenger train No. 97 ran into a freight train which was backing into a side track but had not cleared the main line. Both engines and 2 cars in each train were wrecked. One fireman was killed and 2 employees and 1 passenger were injured. It is said that the flagman of the freight did not go back far enough.

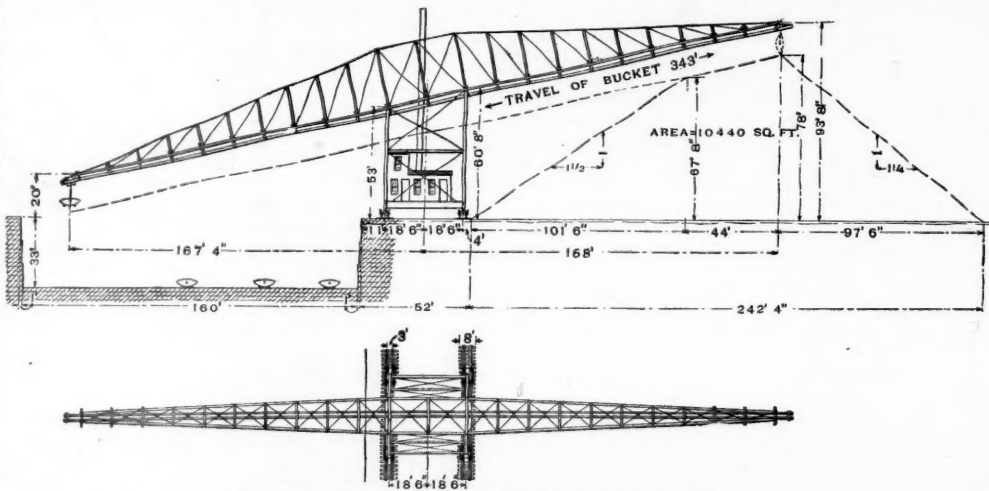
25th, 2 a. m., on Chicago, Burlington & Quincy, in Chicago, a stock train ran over a misplaced switch and into the side of a freight train, wrecking several cars; engineer and fireman injured.

And 9 others on 7 roads, involving 5 passenger and 12 freight and other trains.

#### DERAILMENTS.

##### DEFECTS OF ROAD.

16th, 2 a. m., on Atlantic & Danville, at a point in Virginia, near the station of Milton, N. C., two cars of



The Brown Balanced Derrick—Chicago Main Drainage Canal.

Cross Section of Dump Shown in Broken Line.

a passenger train fell through a bridge 45 ft. high, landing with the bridge in the stream below. The conductor and 5 passengers were killed and 1 passenger and 3 trainmen were injured. This accident was reported in the *Railroad Gazette* Aug. 18 and Sept. 1.

22d, on Ohio & Mississippi, at Louisville, Ky., a passenger train was derailed at a defective switch and 3 cars derailed. One trainman and 3 passengers were injured.

31st, 11:30 p. m., on Central of Georgia, near George-

town, Ga., the engine of a passenger train was precipitated into a creek by the failure of a trestle which had been weakened by a freshet. The train was running slowly and the cars stopped short of the break in the track. The engine fell about 50 ft., and the engine man and fireman went down with it, but escaped without serious injury.

And 9 others on 9 roads, involving 4 passenger and 5 freight and other trains.

And 13 others on 11 roads, involving 2 passenger and 11 freight and other trains.



freight cars were badly wrecked. Two freight trainmen on the ground and the porter of one of the sleeping cars were killed, and 6 passengers and 2 trainmen were injured. One of the latter died the next day. The engine and several cars of the passenger train went over the switch in safety.

8th, on New York Central & Hudson River, at Albany, N. Y., a freight train crossing the freight bridge over the Hudson was derailed as it entered the draw span and several cars ran off the track, damaging the floor and several cars in a freight train passing in the opposite direction on the adjoining track. It is said that the draw had not been properly fastened.

10th, on Great Northern, near Cray, N. D., a freight train was derailed and 13 cars of sheep were wrecked. A brakeman was injured.

10th, on New York, Lake Erie & Western near Lackawanna, Pa., a freight train was derailed and a brakeman injured.

10th, on New York, Lake Erie & Western near Hampton, N. Y., a car in a freight train was derailed and, with one truck of the car next ahead of it, fell down a bank. The cars both in front and behind these two remained on the track and the train ran two miles before the accident was discovered.

12th, on Cleveland, Cincinnati, Chicago & St. Louis, at Swanton, Ind., a freight train was derailed, wrecking the engine and two cars. The fireman and one brakeman were injured, the former fatally.

13th, on Pennsylvania road near Tyrone, Pa., a passenger train was derailed and one car, which was well filled, fell down a bank; but it is said that there were no serious injuries.

16th, on Illinois Central, at Walker, Ill., a freight train was derailed and 13 cars were ditched. One trainman was injured.

18th, on Pittsburgh, Fort Wayne & Chicago, at Whiting, Ind., a mail and express train was derailed and several cars were ditched. The wreck caught fire from the engine, but the flames were soon extinguished. One car contained \$250,000 in gold coin.

19th, on New York Central & Hudson River, at Towners, N. Y., a freight train was derailed and 17 cars were ditched. The conductor was fatally injured.

19th, on Wabash road, at St. Louis, Mo., a switching freight was derailed and a bystander badly injured.

22d, on Pennsylvania road, near Rohrerstown, Pa., a freight train was derailed and several cars ditched. A brakeman was injured.

27th, on Baltimore & Ohio, at Black Lick, O., a freight train running at considerable speed was derailed and the engine and 14 cars were piled up in a bad wreck. A man riding on the engine was killed and the fireman was fatally injured.

27th, on Chicago, Milwaukee & St. Paul, at Amberg, Wis., a passenger train was derailed and the engineer and fireman injured.

29th, on Louisville, New Albany & Chicago, at Harborton, Ind., a passenger train was derailed and 3 cars overturned. The engineer was killed and the baggage master and several passengers injured.

30th, on West Virginia Central & Pittsburgh, near Fairfax, W. Va., a freight train was derailed and a brakeman injured.

And 24 others on 22 roads, involving 5 passenger and 19 freight and other trains.

#### OTHER ACCIDENTS.

18th, 3 a. m., on Baltimore & Ohio Southwestern, near Roxabel, O., the locomotive of a freight train was wrecked by the explosion of its boiler; engineer, fireman and 1 brakeman killed.

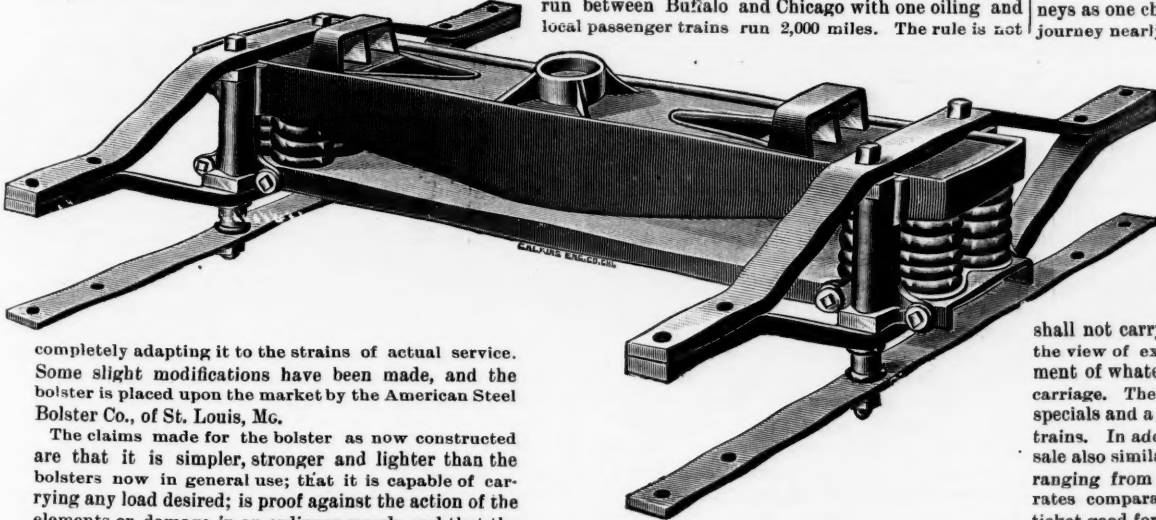
21st, 1 a. m., on Colorado Midland, at De Beque, Col., a sleeping car in train No. 5 was badly damaged by a rock which fell from the hillside, and one passenger was injured.

And 5 others on 5 roads, involving 4 passenger trains and 1 freight train.

A summary will be found on another page.

#### The American Steel Bolster.

In the *Railroad Gazette* of April 14 there was shown a steel truck bolster designed by Mr. M. R. Schaffer, Master Car-Builder of the Missouri Pacific. The bolster has since that time been subjected to exhaustive tests and experiments with a view of strengthening and more



The American Steel Bolster.

completely adapting it to the strains of actual service. Some slight modifications have been made, and the bolster is placed upon the market by the American Steel Bolster Co., of St. Louis, Mo.

The claims made for the bolster as now constructed are that it is simpler, stronger and lighter than the bolsters now in general use; that it is capable of carrying any load desired; is proof against the action of the elements or damage in an ordinary wreck, and that the long service of which it is capable, together with the low cost of maintenance and its scrap value when discarded, make its use a matter of absolute economy. It is made of a soft and tough steel. Arrangements have been made with the Sharon Steel Co., of Sharon, Pa., for the manufacture of these bolsters. J. W. Duntley, Monadnock Building, Chicago, is General Sales Agent.

#### World's Fair Notes.

The directors of the Exposition have determined to mark the celebration of Oct. 9, Chicago Day, by the payment of what they call the whole of the in-

debtedness of the fair, amounting in all to \$1,850,000. This amount includes \$1,350,000 of debenture bonds with interest amounting to \$250,000, and the floating indebtedness and salaries in full to the first of the month, which amount to about \$250,000 more. It is now expected that at the close of the fair the treasury will show a balance of over \$2,000,000. The gate receipts alone during the month of August have amounted to more than \$500,000 a week, and the receipts from concessions have been much heavier than in August, when the total for the month was more than \$575,000.

The question of the removal of the buildings after the fair is over is now beginning to puzzle the authorities. There appears to be no demand for any of the ironwork of any of the buildings, and it is possible that the whole amount may be sold for scrap. The salvage from the wood used will probably not be great, while the staff, plaster, etc., will be of no use except for filling purposes. It is proposed to utilize this latter material for building a hill or mound, or for the creation of a number of small islands upon reefs in the lake a short distance from shore, the islands to be made a part of the park system of the city. One proposition provides for the sale at auction of all the buildings to be removed. It now seems probable that the Art Building, the Horticultural Building and perhaps the Fisheries Building will be left subject to the will of the Park Commissioners. The Exposition is under bonds of \$200,000, to remove all buildings though it may be decided to reconstruct these three buildings upon a more permanent basis and let them stand.

#### Lubrication of Cars.

##### CENTRAL RAILWAY CLUB.

The Central Railway Club held its regular meeting at Buffalo, Sept. 27. President A. M. Waitt in the chair. The attendance of Master Mechanics was large, and the first subject discussed was Lubrication of Cars.

Mr. BRONNER, of the Michigan Central, presented the report of the Committee. It alluded first to the waste of oil by careless oiling. The Committee knows of no dust guard that will keep the oil in and the dust out, during the life of a wheel. The truck gang in a shop needs careful attention, to make sure that trucks leaving the shops are true in every particular and that the weight is evenly distributed on the bearings. Outside inspection of trucks should be such as to maintain this condition. Bearings should be of solid brass or bronze, bored to size, with a thin lining of soft metal. Every invoice of bearings should be closely inspected before being sent out for use. No secondhand bearings should ever be applied. When applying a brass, lubricate it first. The oilbox should be packed firmly, but not too solidly, with a good quantity of wool waste, which has previously been soaked three or four days in lubricating oil. At oiling stations the waste or packing should be stirred up and properly placed in the box so that oil can reach every part of the journal; then after the application of oil, the box covers should be closed, and there should be covers to close, which is too frequently not the case. One great cause of hotboxes in early winter is the use of lubricating oils which are not of proper cold test. The reverse of this is true to some extent in the spring.

The discussion of this report brought out the practice of a number of roads. On the Michigan Central through trains are oiled at the starting point and at Detroit. On the Lake Shore & Michigan Southern through trains run between Buffalo and Chicago with one oiling and local passenger trains run 2,000 miles. The rule is not

easily trace it to some other cause rather than improper packing. Much care is taken in the fitting of brasses, especially on passenger cars, to see that they are smooth and true. The same was true of the bearings. No man is allowed to have any free oil.

Mr. LAVERY of the same road said that they did not consider 2,000 miles excessive for local trains with one oiling. They had a train that ran as high as 2,500 and 3,500 miles.

Mr. WAITT said that dope was used on the Lake Shore; it is taken out after six months and most of it thrown away, the better part being re-soaked and used on freight cars. In putting new dope into an oil box with old, the new is placed at the bottom with a little oil at the top. The chief cause of hot boxes was imperfect axles, made of scrap wrought iron.

The West Shore oils at all principal main line stations. The Michigan Central has about 35 hot boxes a month. Mr. Bronner referred to the importance of regular and uniform reports of hot boxes.

Mr. WAITT, reporting the results of a two years' study of journals made with a view to discovering the cause of hot boxes, said he had found that in 90 per cent. the hardest wear on the bearing was at one of the ends, but in all cars not a hot box had been reported where the M. C. B. 4½ x 8-in. journal was used. He believed that a large percentage of hot boxes was caused by journal bearings not being rounded on top, the imperfect fitting of keys, and from not conforming to M. C. B. standards.

Mr. WEST indorsed the statements of Mr. Waitt in regard to axles. The experience of his road was that the iron axle had become a back number. He was in favor of the adoption of a gauge for the outside bearings of journals and the inside bearings of journal keys. No hot boxes had been reported where steel axles were used.

The Erie and the New York, Chicago & St. Louis use steel axles on passenger cars, and have practically no hot boxes.

Mr. WEST for the Committee on Testing Locomotive Boilers made a verbal report advocating a general inspection of boilers once a year, the flues to be removed. Staybolts were broken by washing hot boilers with cold water; the use of cheap steam gauges giving inaccurate indications was condemned. The importance of drilling staybolts was brought out by several speakers. Mr. GRIFFITH opposed blowing out a boiler while under pressure, as it is dangerous where the water is not good.

The subjects for discussion at the next meeting are: Air Brakes—Their inspection and maintenance, J. A. Chub, James Macbeth, Robert Gunn. Heating of Driving Boxes and Eccentrics, W. Lavery, P. E. Garreson John Mackenzie.

#### A Belgian Experiment in Fares.

We noted recently (Aug. 4, p. 586) an innovation in passenger rates that has been introduced on the Belgian state railroads, in the sale, at a low rate, of subscription tickets, good for various periods which entitle the holder to travel as often and as far as he may like in any part of the country during the stated period, on any of the lines belonging to the system. The prices of these tickets for 15 days are 50 francs for first class, 38 francs for second class and 25 francs for third-class passengers. This is about like paying \$10 for a first-class ticket good on all the lines of the New York Central for as many journeys as one chooses to take, for 15 days. Only no single journey nearly as long as from New York to Buffalo is possible in Belgium. The tickets can be obtained at any of the railroad stations by presenting one's photograph, signing the ticket immediately on receipt and making a deposit of five francs in addition to the regular price as a guaranty for the prompt return of the ticket at the date of expiration. Of course, the tickets are not transferable, nor can they be presented for redemption after having been purchased. There are no restrictions whatever attending their use, the only stipulation being that the holder shall not carry along any other person's baggage, with the view of exempting any such person from the payment of whatever charge might be properly due for its carriage. The tickets are good for all trains, except specials and a few particularly designated international trains. In addition to these 15-day tickets, there are on sale also similar subscription tickets for longer periods, ranging from three months to a year, and for these rates comparatively still lower have been made. A ticket good for a whole year, for example, costs, for first class passage, 800 francs; for second class passage, 600 francs, and for third class passage, 400 francs. The arrangement which has been in force since June 15 of this year is expected to exert a far-reaching influence on railroad traffic throughout the country. The extent of the lines on which it is in operation amounts to 3,250 kilometers, or a little over 2,000 miles.

The state railroads form about three-fourths of the whole railroad system of Belgium, which, it should be remembered, has an area of but 11,375 square miles. Massachusetts and Connecticut together have 13,305 square miles, and perhaps the best comparison to make is with tickets good on 2,000 miles of railroad in these two states.





ESTABLISHED IN APRIL, 1856.  
Published Every Friday.  
At 73 Broadway, New York.

### EDITORIAL ANNOUNCEMENTS

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The fall meeting of the American Society of Railroad Superintendents, at Chicago next Thursday, comes after the meeting of the American Railway Association, instead of before it, as in previous years. This may be a good change. The Superintendents' Association is fundamentally a discussing body and the very self-restrained discussions of the American Railway Association may make the members of the Superintendents' Association just mad enough at themselves as members of the American Railway Association to lead them to overhaul in the deliberative body their own doings in the business body. Of course the theory that proposing and thrashing out a subject in the Superintendents' Association would be first rate preparation for action in the other body is also a very attractive one, but we question if it has worked to much profit. At any rate the programme of the Superintendents' Society allows ample room for the discussion of anything that the American Railway Association may do, and in case it does nothing there will be a free field for taking up on Thursday what ought to have been done on Wednesday; for the several topics prescribed—signals, accidents, catechism, improvements in freight train service, reduction of expenses and promotion of efficiency of employees—cover as much as the silver bill.

The abstract, on another page, of replies received by the Rail Section Committee of the American Society of Civil Engineers will, we judge, be of considerable interest. These replies, it will be observed, bear especially on the upper corner radius, the best length of which is still in controversy, and will have to be arrived at by the slow and safe process of natural selection. We have considerable doubt if  $\frac{5}{8}$  of an inch is the best radius, and are inclined to think that  $\frac{1}{2}$  of an inch would have been better; but probably the radius adopted was a judicious compromise, and at any rate the result of the Committee's action will be a trial on a large scale of a comparatively sharp corner. It is interesting to analyze the replies which appear elsewhere. It will be seen that those in favor of a radius of  $\frac{5}{8}$  or less number 20, those positively in favor of a larger radius are five, and the non-committal replies are four. There are nine out of all these who favor  $\frac{1}{2}$  of an inch unqualifiedly. But the numbers are not the only measure of these expressions of opinion; the actual experience is a better test. Of those who stand for a large corner radius, only two have had experience with rail sections of sharp corners, and of those who favor a radius of  $\frac{1}{2}$  or less, 15 have had such experience. Of those who recommend without reservation a  $\frac{1}{2}$  of an inch, six have had actual experience with that radius. So the weight not only of numbers but of experience seems to be decidedly with the advocates of the small corners. The evidence so far accumulated will justify any engineer in accepting this detail of the Committee's section; indeed, it seems to make it his duty to try it. Of course, the responses are very few, as is generally the case with circulars of this sort, but we

must take them as characteristic and as the best obtainable record of experience and opinion. A very interesting feature in these replies is the expression of the engineers of the great Pennsylvania system, which uses a large corner radius as standard; yet the three engineers whose replies appear favor a radius  $\frac{1}{2}$  of an inch; and this suggests that if motive power men had been asked to express themselves we might have had a very different set of opinions. The question of the slope of the side of the head is left as obscure as it ever was so far as the opinions now published go, and that of big or little heads is not touched at all. This last, as we have often said, is the most important of all the details of the sections recommended by the Committee; it seems to rest on sound theory and on a good deal of actual experience. On the whole, the rational thing for railroad engineers to do is to accept the sections of the Committee and to give them a thorough trial. That is the only way to advance solidly in this complicated investigation, and the set of sections now proposed rests on the best authority that is available.

### Pulling and Starting Power of Electric and Steam Locomotives.

In 1886 the M. C. B. Committee on Air Brakes made tests to learn the starting power of steam locomotives. The results showed that where there was slack between cars a locomotive would start the train one car at a time, and, during the period of starting, until the last car was moved, the locomotive would store enough power in its momentum, and in the momentum of the cars immediately following, to put the whole train in motion, but a larger train could be thus moved than the locomotive could haul continuously. Without slack in the train the locomotive could not start as heavy a train as it could start with slack. It is common practice in starting closely coupled trains where there is practically no free slack and but little spring slack, to bunch the train and then go ahead quickly, and by a jerk thus obtained, start the train from a state of rest and permit the oil to reach the bearings from which it had been previously squeezed out during the period of rest. The static friction which has to be overcome at the instant of starting is very great in comparison to the friction after the train is once moved ever so little. The static friction, so called, is not wholly due to the squeezing out of the oil between the bearings and the journals, but, as well, to other conditions, arising from a period of rest, that need not be mentioned here. What is important here to know is that there is a large static friction which is best overcome by the "surging" or "jerking" of the motor. Those who have observed the records made in a dynamometer car know that when a train is started, by surging or jerking, the hauling force for an instant, as shown by the dynamometer, is frequently double that which the locomotive can maintain. It is commonly the case that the starting surge for an instant, as recorded by the dynamometer, is 50 per cent. more than the maximum haul of a locomotive during a steady pull.

In discussing the starting power of motors, one must discriminate between the surging and jerking at the outset, which will enable a motor to move a train which it cannot haul continuously, and the hauling power, which can be developed under a steady pull at a very slow speed. Practically all motors, whether driven by electric or steam power, can give the greatest hauling power at the slowest speed. That is to say, the maximum hauling power of motors is universally greater at five miles an hour than at 20. When the term "hauling power" is used, it is generally understood to mean the pull, at the contact between the drivers and the rail, which the motor can exert continuously, or at least for a sufficient period to accelerate the train to the desired speed. In steam locomotives the hauling power can be exerted continuously, but in electric locomotives there is sometimes a danger of "burning out" the motors, and this is why the maximum hauling power of electric motors is seldom used. Generally, electric locomotives are so built that the weight on drivers can be utilized fully without burning out the wiring.

The hauling power, not the surging or jerking power, is wholly dependent upon the adhesion of the drivers to the rail when the motor, whether steam or electric, is properly built; for the reason that sufficient turning power is always provided to slip the drivers at starting. No locomotive is considered well designed if the drivers cannot be slipped at starting. As the hauling power is limited by the adhesion weight it becomes necessary to use the adhesion to the best advantage.

When the Webb compound was put on the Pennsylvania road several years ago, railroad men here

had a chance to prove what they had always believed to be a fact, namely, that parallel rods are a necessity when the entire adhesion of a locomotive is to be utilized. The Webb compound in starting would slip first one pair of wheels and then the other, there being no parallel rods, and would never give the maximum hauling power that might be expected from the weight on drivers, except when it happened that the maximum turning power of both sets of cylinders and the maximum adhesion of both pairs of drivers occurred at the same time. The addition of parallel rods to the Webb locomotive would put the turning power of all three cylinders in action together, and would couple the adhesion of the drivers so that one pair of wheels could not slip and thus reduce the traction without the others slipping also. This point bears directly on the hauling power of electric locomotives without parallel rods and is the reason for the emphasis put on the matter here. To gain the maximum hauling power of a motor of a given weight the driving wheels must all be coupled together. This joins together the turning powers, which produce the movement of the motor and also couples the adhesion of the drivers to the rail, which furnishes the fulcrum by which the turning power hauls the train.

Bearing this in mind, the reasons for the inferior hauling power of the electric locomotive at the tug-of-war on "Railway Day" at the World's Fair is apparent. The electric locomotive weighed about 30 tons on drivers. It is said that the steam locomotive was five tons heavier, but whether it was or not the electric locomotive did not pull on the wire rope that connected the two motors with anything like the force that might have been expected from the weight on its driving wheels. In fact the steam locomotive just "walked away" with the electric motor. The design of the electric locomotive was given in the *Railroad Gazette* July 14, 1893. There are no parallel rods and there is considerable overhang at each end from the center of the driving wheels to the ends of the draw bars. The center line of draft passes considerably above the center of the wheels, hence when the electric locomotive pulls, the weight is reduced on one pair of drivers and increased on the other pair. The result was in this case that the wheels that had the least weight slipped. The increased weight on the other wheels could not be utilized because not enough current could be sent to the electric motor, on the axles of the drivers having greater weight, to produce the necessary torque on the shaft. There was current enough on the feed wire running to the motor, but not within the motor itself. The want of current may be thus explained: Given a practically unlimited supply of current at a given pressure, the amount that will flow into a motor depends upon the resistance which it meets. It is a common practice to arrange the connections for electric locomotives so that the current will pass first through a resistance box, and then through the motors in series, that is, through first one and then the other. In this way at starting the current meets the resistance of the resistance box and the resistance of the wiring on the two motors all taken together. As soon as the motor starts it generates a counter-current which backs down the main current and acts like a resistance. After the motor has attained some speed the counter-current becomes so great that it is necessary to cut out the resistance box and put the motors in multiple, that is, so that the current divides and goes in part through each. This reduction of resistance to some extent counterbalances the increase of resistance due to the counter-current and the current flowing into the motor is more than it would be if the resistances were not cut out. In this way more torque on the axle is obtained at high speed than would be the case if the resistances remained connected up exactly as they are used at starting.

All this bears on the question of the starting power of electric motors in the following way: When connected up for starting, if there are no parallel rods and one of the pairs of drivers slips and the motor revolves rapidly the counter current generated will be so great as to prevent the necessary amount of direct current reaching the other motor. Briefly, the slipping of one pair of drivers and the consequent rapid revolving of one motor generates a counter-current which prevents the main or direct current from reaching the other motor in sufficient quantity to utilize the weight on the driving wheels. Hence the necessity for connecting the wheels together with parallel rods if it is so desired to utilize the maximum adhesion of the drivers to the track.

Naturally the opinions of various observers of the "tug of war" between the electric and steam locomotives differ considerably. As a rule, the electricians have claimed that the electric locomotive failed because it was lighter than the steam locomotive, and some of



the steam locomotive men have claimed that electricity "won't pull like steam anyhow." One analytical writer has discovered the difference in pull to result from the difference of time during which the two locomotives have been in service, he having found that the electric locomotive is a comparatively new machine. The explanation which we have given here is in accord with the facts of the tests, and with the experience which has been had before with motors having disconnected driving wheels.

In the *Railroad Gazette*, Sept. 22, Mr. Lincoln Moss has given the pull of the Daft electric motor on the Manhattan Elevated road as 4,500 lbs. in correction of the figures given in an editorial in the *Railroad Gazette* Sept. 15, viz., about 2,000 lbs. at a maximum. Mr Moss is quite right, inasmuch as the Daft locomotive did show a pull of "4,500 lbs. for an instant on a dry track, which is often sanded at that point by engines hauling express trains." Our figure was too low, and should have been higher. The figures were taken from a paper prepared by Mr. Moss for the American Society of Civil Engineers in 1890. (See *Transactions*, 1890, page 193). The paper gives diagrams of hauling power which show the "surging" or "jerking" power at the instant of starting to be about 3,500 lbs., and the maximum hauling power up to about seven miles per hour to be as follows: 2,200, 2,500, 2,800, 2,000 and 2,400 lbs. In the *Railroad Gazette* editorial of Sept. 15 a comparison was being made between the electric motor and the steam locomotive only to show that the steam locomotive had a decided advantage in the matter of hauling power. The weight of the steam locomotive on drivers was 23,900 lbs. or approximately 12 tons. The maximum hauling power of such a locomotive with a sanded rail, under the best conditions, would be between 7,000 and 8,000 lbs., and as the cylinder power of the locomotive is sufficient to utilize the weight on drivers the maximum pull of the locomotive under the best conditions up to five miles an hour would be between 7,000 and 8,000 lbs. The diagrams of the hauling power of the locomotive do not show this amount because there was not resistance enough in the train to permit this power to be generated. The surging or jerking power of the steam locomotive, as well as the electric, depends upon the slack in the train and a comparison cannot be made on this basis without knowing all the conditions. It is enough for the present purpose of illustration to set aside all comparison except that of the average hauling power of the electric locomotive, which was doing as much as it could be made to do from the way it was constructed, and the hauling power of a steam locomotive which was doing its normal amount of work; remembering that the steam locomotive was not pulling with anything like its maximum hauling power. A comparison of this kind will be based on the diagrams of "pull of motor" and "pull at drawbar" given in Mr. Moss' paper. After the period of "jerking" and "surging" the maximum pull of the two motors shown by the diagrams was as follows:

Electric locomotive—2,200, 2,500, 2,800, 2,000, 2,400, lbs.

Steam locomotive—2,800, 3,000, 3,500, 3,500, 3,000 lbs.

The maximum hauling power which the steam locomotive in question can maintain for a considerable period after starting, under the best conditions with sand on the rails, is between 6,000 and 8,000 lbs., while the maximum of the electric locomotive even with a jerk was but 4,500 lbs., thus showing that the electric locomotive was not a match for the steam locomotive in hauling power.

The discussion of the relative hauling powers of steam and electric locomotives is important, as upon the hauling power under adverse conditions depends very largely the practicability of a new form of motor. The interest in compound locomotives was at first very largely confined to the hauling power under adverse conditions.

#### The Security of Postal Cars.

It is, we believe, a common notion that the occupation of the clerks of the Railway Mail Service is peculiarly hazardous. We frequently hear of their being killed and wounded in wrecks, and we sometimes hear of their being burned to death, and we are apt to conclude that the position of the cars in which they work, near the head of the train, the fact that there must be many lights in each one of those cars, and that each car must be well heated, make the calling even more perilous than that of the trainman. As a sequence of this belief we often hear of the demand for better and stronger postal cars and for better arrangements for heating and lighting. It will be interesting to examine the matter a little in the light of collected statistics.

The latest annual report of the Superintendent of Railway Mail Service which is available is for the year ending June 30, 1892. From that report we find that in the four years including 1889 and 1892 there were 32 clerks killed and 553 injured in train accidents. The number killed per thousand employed was 1.35, the number injured was 23.3, and the total casualties per thousand were 24.5. In the year of greatest fatality, 1891, there were 2.1 clerks killed per thousand employed. We may compare these figures with the casualties among trainmen of all classes (omitting, of course, the postal clerks), in train accidents, by using the figures of the Interstate Commerce Commission. The last year available in the reports of that Commission is that ending June 30, 1891. In 1890 and 1891 the trainmen killed per thousand employed were 2.6, injured 13.2, and the total casualties, killed and injured, 15.8.

It will be seen that the mortality was much greater while the injuries were fewer. A plausible explanation is easy to make. The trainmen include not only men exposed to the same dangers as the postal clerks, that is, baggagemen and expressmen, but they include also enginemen and firemen whose position is undoubtedly a good deal more dangerous than that of any other class. That is, they are in greater peril of death than any other class of trainmen, although they do not suffer so many small injuries as the brakemen. Therefore, one would naturally suppose that the average mortality among trainmen would be higher than among the postal clerks. On the other hand, the postal clerks might naturally receive more injuries, of greater or less severity, than the average trainmen, for they are, by the nature of their occupation, shut up in a place where they can get no warning even of the slightest accident, and they are standing on their feet with their sides toward the engine, and a slight shock to the train is pretty sure to throw them down. At any rate, these explanations of the relative numbers of the two classes of casualties will do for want of a better.

The theory that postal cars are weak, which is often started after an accident in which postal clerks have been killed or injured, is apparently not a very good one. Concerning this the Superintendent of the service says:

"Both the departments and the railroad companies have given the subject the most careful and thorough consideration, their aim being to combine in these cars the maximum carrying and resisting power with the greatest possible number of facilities for the comfort and health of the clerks and the quick and efficient distribution of the mails. The first full railway postal cars used in the United States were designed by and largely built under the personal supervision of the first General Superintendent of this service, the specifications for the framework being provided by one of the most skillful and experienced Master Car Builders of that day. The Department has furnished plans for the construction and arrangement of the interior of every postal car built since that time and a general plan of the entire car, but has until recently permitted the companies to set up the framework according to the plans and specifications followed in the building of the best and most durable coaches, and has not accepted cars until Division Superintendents have examined them and pronounced them suitable for the work. . . . The managers of the great railroad systems realize that in the matter of car construction, safe and powerful lights, abundant and well regulated heat, and in most other respects the interests of their companies and of the department are identical and have, as a rule, equipped our cars with as good (and in many cases better) lighting and heating facilities as they have placed in the palace coach of their best and fastest trains."

Considering that the higher speeds and greater number of trains must almost inevitably increase the number of accidents, the Department not only raised the specifications for the framework of new cars, but caused a careful inspection to be made of every one in use and in reserve, and directed the withdrawal of such as were not found to be in first class condition and supplied with the safety appliances used on the best passenger coaches of the same line. This movement received the hearty co-operation of the railroad companies. Many new cars, built with a view to strength and utility, have been put in service, and it was one of these that was crushed and destroyed by fire in the Shreve accident, in which four postal clerks lost their lives. This accident, by the way, is not included in the statistics given above, as it occurred after the close of the fiscal year for which those statistics are made. So far as the construction of the cars goes and their equipment with proper brakes, platforms and couplers, they are probably, as an average, quite up to the standard practice.

There is one detail, however, to which the Superintendent calls attention in which the postal cars could be improved; that is, by the use on them of the vestibule as it is used on the best of modern passenger cars. The danger of wrecking the cars would be diminished in a certain degree, and it is believed that the clerks could do more work and better work because of the diminished oscillation of the cars.

There is one other feature of the equipment concern-

ing which some curious information can be got out of this report; that is, the matter of lighting. The officers of the service have several times recommended improved arrangements for lighting in the following order of preference: Electricity as soon as it is practicable, next to this gas and next the best kerosene lamps. It is obvious that lighting with oil lamps introduces the danger of fire from that source. We find in looking over the report for 1892 five fires which are supposed to have originated from the lamps. Besides these there were eight which appeared to have started from stoves, and six in which the origin of the fire was obscure. While no lives were lost from either of these fires there was considerable mail matter destroyed, and it is quite obvious that the peril of everybody on the train was considerably increased by the fact of these cars being equipped with oil lamps.

Another point brought out by the report is one that is not likely to have been thought of by those who have not paid especial attention to the subject, and that is the amount of mail matter injured by oil from the lamps in accidents where there was no fire, and where, in many cases, the damage was but slight. We find in the report under consideration 43 instances of this sort; that is, the mail was more or less damaged by lamp oil. Some of these accidents were severe, amounting to nearly total destruction of the car, and some were slight collisions and derailments with very little damage. But the fact that there are so many instances in which the oil was thrown about so as to damage the mail matter is very suggestive of the additional element of danger from the use of oil lamps in these cars.

#### August Accidents.

Our record of train accidents in August, given in this number, includes 50 collisions, 90 derailments and 7 other accidents, a total of 147 accidents, in which 66 persons were killed and 162 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	But-ting.	Crossing and other.	Total.
Trains breaking in two.....	5	0	0	5
Misplaced switch.....	1	0	4	5
Failure to give or observe signal.	3	0	3	6
Mistake in giving or understanding orders.....	0	4	0	4
Miscellaneous.....	10	0	4	14
Unexplained.....	4	8	4	16
Total.....	23	12	13	50

DERAILMENTS:	Total.
Loose or spread rail.....	3
Defective bridge.....	2
Defective switch.....	4
Defective frog.....	2
Bad track.....	1
Broken wheel.....	4
Broken tire.....	1
Broken axle.....	5
Broken truck.....	2
Fallen drawbar.....	2
Boiler explosion.....	1
Fallen brakeman.....	2
Loose wheel.....	1
Misplaced switch.....	2
Careless running.....	2
Track repairs.....	1
Bridge repairs.....	1
Bad switching.....	1
Animals on track.....	4
Landslide.....	2
Washout.....	2
Wind.....	1
Malicious obstruction.....	1
Fire.....	1
Unexplained.....	42
Total.....	90

OTHER ACCIDENTS:	Total.
Boiler explosion.....	1
Cars burned while running.....	2
Breakage of rolling stock.....	1
Other causes.....	3
Total.....	7

Total number of accidents..... 147

A general classification shows:

	Col-lisions.	Derail-ments.	Other acci-d'ts.	Total.	P.c.
Defects of road.....	0	12	0	12	7
Defects of equipment.....	5	18	2	25	17
Negligence in operating.....	29	7	2	38	26
Unforeseen obstructions.....	0	11	3	14	10
Unexplained.....	15	42	0	57	40
Total.....	50	90	7	147	100

The number of trains involved is as follows:

	Col-lisions.	Derail-ments.	Other acci-d'ts.	Total.
Passenger.....	29	26	5	60
Freight and other.....	63	65	2	130
Total.....	92	91	7	190

The casualties may be divided as follows:

	Col-lisions.	Derail-ments.	Other acci-d'ts.	Total.
KILLED:				
Employees.....	7	18	3	28
Passengers.....	16	14	0	30
Others.....	6	2	0	8
Total.....	29	34	3	66
INJURED:				
Employees.....	38	29	0	67
Passengers.....	44	44	1	89
Others.....	0	6	0	6
Total.....	82	79	1	162

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road.....	5	1	1	4
Defects of equipment.....	0	0	3	2
Negligence in operating.....	25	70	12	43
Unforeseen obstructions and maliciousness.....	0	2	3	8
Unexplained.....	0	13	9	10
Total.....	30	86	28	67

Nineteen accidents caused the death of one or more



persons each, and 32 caused injury but not death, leaving 96 (65 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with August of the previous five years shows:

	1893.	1892.	1891.	1890.	1889.	1888.
Collisions.....	50	91	111	85	81	88
Deraillments.....	90	119	110	82	82	121
Other accidents.....	7	8	2	11	6	13
Total.....	147	221	223	178	169	222
Employees killed.....	28	35	36	65	28	43
Others.....	38	15	55	35	23	13
Employees injured.....	67	104	152	196	122	100
Others.....	95	109	189	96	131	102
Passenger trains involved	55	68	92	66	66	77

#### Average per day:

Accidents.....	4.74	7.13	7.19	4.74	5.45	7.16
Killed.....	2.13	1.61	2.94	3.23	1.64	1.77
Injured.....	4.94	8.69	11.00	9.42	8.16	6.54

#### Average per accident:

Killed.....	0.449	0.226	0.408	0.562	0.301	0.218
Injured.....	1.041	0.964	1.529	1.640	1.496	0.914

The worst three accidents in August were those at Dykeman's and Long Island City, N. Y., and Chester, Mass., all occurring within five days. These have been already discussed in our editorial columns. The Chester accident is classed under the head of "negligence in operating," although we generally put all cases of trains falling through bridges under "defects of road." In this case that would be manifestly wrong, as it is agreed on all sides that the Chester bridge was sound, and strong enough for the service required of it, if it had not been ignorantly or carelessly weakened. The occurrence of these three accidents so close together, especially as two of them were near New York City and thus were the subject of extended newspaper comment, as drawn public attention to the dangers of railroad travel more sharply than it has been drawn for a long time; and the Colehour, Manteno and Kingsbury collisions in September have heightened the public interest.

The presence of these three cases in the record obscures two others which were serious and startling, though far less so than the Long Island and Chester cases. We refer to the falling of a passenger train through a bridge in Virginia, on the 16th, and to the derailment at Lindsey, O., on the 6th. So far as we have learned, neither of these accidents has yet been reported upon by the State Railroad Commissioner.

Near Parkersburg, W. Va., on the 18th, five section men on a hand car were badly injured by being run into, in a tunnel, by a freight train. At Rosport, Ont., on the 5th, a gravel train ran into a hand car and injured seven men, four of them fatally. Near New Laredo, Mex., on the 9th, the engine, baggage car and sleeping car of a passenger train was derailed and overturned in several feet of water while running on a submerged track.

At Leroy, N. Y., on the 20th, a carriage containing five persons was struck by a passenger train of the Lehigh Valley and all five were killed. Near White Bear, Minn., on the 6th, a man and two women in a carriage were killed by a train of the St. Paul & Duluth.

At St. Louis, on the 9th, a collision of electric street cars, in which were 200 passengers, resulted in the death of a boy and the injury of a conductor. A similar collision at Port Richmond, N. Y., on the 7th, which, however, did no great damage, was due, according to the reports, to the recklessness of an 18-year-old motorman. In Cincinnati, on the 31st, a horse car was struck by a locomotive of the Cleveland, Cincinnati, Chicago & St. Louis, and the driver was killed.

#### The Latest New York & New England Story.

The New York & New England's application to the New York State Railroad Commissioners for approval of its project for a railroad from Brewsters southward about 50 miles to Leggett's Point, which would give the New England a through line from Boston to within two or three miles of Manhattan Island, has led to renewed discussion concerning the long-desired competing passenger line between New York and Boston. The press has been well "worked," and one sensational New York paper prints a two-column article telling that President McLeod, of the New York & New England, has secured the co-operation of Messrs. Gould and Sage, of the Manhattan Elevated, thus securing an entrance to the lower part of New York City. Both these men have been interviewed by reporters, and their remarks are substantial denials of connection with McLeod.

An arrangement for running rights over the Manhattan would be a vital feature of any scheme of this kind, for the New York & New England has failed in its attempt to get through passengers to patronize a line terminating at the Harlem River (155th street); and the New York, New Haven & Hartford, possessing such a line, does not even try to use it for through business between New York and Boston, though it would, of course, be glad to do so if passengers would go there.

While Mr. McLeod's scheme is practicable, if he can raise the money to carry it out, it is well to remember that the amount of money requisite is very much larger than has been named in the rose-colored statements lately published; so much so that conservative investors say now, as they have said before, that the establishment of a paying line is impossible. The Second Avenue Elevated line is said to be strong enough to carry standard cars and engines, but it is not; it would have to be strengthened. The cost of doing this for five miles may be roughly estimated by the fact that the reports of the company indicate that this structure cost \$1,000,000 a mile. Again, the present business on this elevated line would be seriously interfered with,

or else it would have to take precedence of the through business and occupy the structure during the busy hours. The station platforms would have to be cut away for wider cars, and at best the running of fast trains and slow trains over the same line would be a great drawback. It is proposed to have a terminal at Twenty-third street, nearly a mile farther south than the Grand Central station; but aside from the fact that the estimate of the cost of sufficient real estate at that point, \$1,000,000, is ridiculously low, it should be noted that the location is very unfavorable in the matter of grades. The terminus would be at the foot of a hill.

The estimated cost of the line from Brewsters to Leggett's Point is \$2,000,000, or \$40,000 a mile; but the New York & Northern, a parallel line, was reported by the company in 1887 as costing \$6,000,000, or over \$100,000 a mile, and the last annual report gives "construction and equipment" as over \$13,000,000; say \$200,000 a mile for the road. Leggett's Point is about two miles from the Manhattan Elevated line, and those two miles would probably cost more than the projector's estimate for the whole of the other 50. If the line were completed it would be some 15 miles longer than the New York, New Haven & Hartford,\* and the grades and curves of the New England main line are unfavorable.

When we consider that back of all this is a discredited promoter, and that in these distressing times the soundest schemes cannot be financed by the most trusted bankers, we are tempted to think that the Americans who swallow the story are as arrant *gobemouches* as the old Athenians or the modern Parisians.

#### Annual Report.

The Illinois Central.—The annual report of the Illinois Central for the year ending June 30, 1893, is especially interesting for several reasons, and that one for the year ending June 30, 1894, will perhaps be still more interesting for some of the same reasons. Within the last year, or a little more, the company has spent a great deal of money in improving its Chicago entrance and terminals and for rolling stock, and the property is so situated as to be particularly affected by the World's Fair traffic. Moreover, the natural growth of its suburban traffic is great. For these reasons, above all others, the report which now appears is especially important.

We are immediately struck by the fact that while the mileage operated during the year has been almost precisely the same as in the previous year (2,888 miles and 2,884 miles) the gross receipts from freight have decreased about one-quarter of one per cent., the receipts from passengers have increased 17.39 per cent., and the gross traffic receipts altogether have increased 4.16 per cent. The operating expenses have increased 0.89 of one per cent., and the net earnings after deducting operating expenses and taxes increased 11.29 per cent. These figures are quite remarkable. The various amounts are as below:

Gross earnings.....	\$20,075,191
Operating expenses and taxes.....	14,283,934
Net earnings.....	5,811,256

The gross earnings from freight for the year were \$12,781,201, and from passengers \$5,151,393. The other principal sources of revenue were from mail which increased, express which increased, rent of property and of tracks which decreased, switching which increased, interstate transfer and receipts over other lines which also increased.

The gain in passenger receipts was in spite of a decrease in rate per mile and in average fare for each passenger, that is, the rate received per mile from each passenger in 1893 was 1.999 cents, in 1892 it was 2.101 cents, and the average fare collected from each passenger was 29.17 cents in 1893 and 36.84 in 1892. Of course the reader will at once see the bearing of these figures. The decline in average rate of fare and in receipts per passenger was due to the great relative increase of the number of short trip passengers, that is, the suburban and World's Fair business. This is reflected also in the increase in passenger train loads. The mileage run by engines hauling passenger trains increased only 4.2 per cent. while the passenger miles increased 23.42 per cent., the total passenger miles being in 1893 257,744,648. The average train load in the latter year was 40.33 passengers against 34.01 in 1892. The receipts per passenger-train-mile were 97.3 cents in 1893 and 87.92 in 1892. All of these figures indicate very clearly the great effect on the passenger earnings of the short trip business. Fortunately, the company publishes the receipts from passengers by months, which enables us to judge as to the effect which the World's Fair business had begun to exert in the first two months of its existence; for it must be remembered that this report covers only those two months of the World's Fair business which were, of course, the months of least business. The really interesting results will be obtained when we get the returns up to the end of October. We find that the passenger receipts in May and June of 1893 were 65 per cent. greater than they were in the same two months of 1892, and in 1892 they were 12 per cent. greater than in the same months of 1891. We find further that for March and April in 1893 the passenger receipts increased 19 per cent. over 1892 and that in 1892 they increased 14 per cent. over 1891. We find that for

Boston to Brewsters.....	190 miles
Brewsters to Leggett's Point.....	50 "
Leggett's Point to 129th street.....	2 "
129th street to 23d street.....	5 "
Boston to New York.....	247 miles

the other eight months of the year the passenger receipts in 1893 increased 2 per cent. while in 1892 they increased 16 per cent. From these figures the influence of the World's Fair traffic began to be seen in March and April and had become very great in May and June.

The decline of one-fourth of one per cent. in the receipts from freight took place notwithstanding some favorable conditions. The ton miles moved in 1893 were 1,512½ million, an increase of 7.17 per cent. over 1892. The average train load was 153 tons against 138 in the preceding year, but the rate per ton per mile was 0.845 as against 0.908 in 1892. This less average rate per ton per mile is not attributed to a lower rate charged, but to the fact that there was a large decrease in the volume of cotton and other high-priced freight during the year, and an increase in the tonnage of coal, lumber, and other cheap freight. The cotton delivered at New Orleans by the Illinois Central and the Yazoo & Mississippi Valley railroads fell off 47 per cent., and the entire cotton crop of the United States decreased 26 per cent. So notwithstanding the important increase of ton miles the freight revenue diminished.

New equipment to the value of \$1,815,000 was ordered, and of this \$1,599,000 was charged to profit and loss. Permanent improvements charged to capital account net \$4,107,078. Of this much the largest part was spent on the Illinois Central proper. The net cost of elevation of tracks in Chicago was \$825,825. The capital stock was increased \$5,000,000 and the funded debt \$24,952,000, the last item being the provision for the purchase of the Louisville, New Orleans & Texas. The road and equipment account increased \$4,161,596, and the stocks and bonds owned, \$23,366,594.

A careful reading of the report itself and a comparison with former years will show a steady growth in earnings and in earning capacity. The phenomenal increase in passenger earnings should not obscure the increase in recent years in that greater factor the freight earnings, which even now are 2½ times the passenger earnings and are 60 per cent. of the entire income.

The shops of the Pennsylvania and the Philadelphia & Reading are gradually resuming full time, and it appears from local newspaper accounts that workmen are being taken back at all principal points on the lines of the Pennsylvania both east and west of Pittsburgh. A Chicago newspaper, which apparently has made careful inquiry, reports that the men discharged within the last three months are being rapidly taken back in all departments of the railroad service. The Atchison, Topeka & Santa Fe has taken back 200 shopmen in Kansas, and the Southern Pacific shops at Oakland and Sacramento are running full time with full forces. The Louisville & Nashville has started up most of its shops, but has had to get new men in many of them. The company has been bothered with small strikes at Louisville and one or two other points, and among its other annoyances it has 25 lawsuits brought by workmen who claim to have been engaged to come to Louisville by misrepresentation. Evidently a "labor" lawyer has got hold of these men. The Baltimore & Ohio has held long conferences with some of its employees concerning a general reduction in pay of 7½ per cent. It does not yet appear when this reduction is to begin or how determined the company is in the matter. These employees claim to represent four fifths of the whole force, but, as in so many other cases of a similar kind, they do not furnish satisfactory evidence of this. The leaders of the Brotherhood men on the Big Four say that they have definitely decided not to strike. Press dispatches reported strikes on three different roads at Memphis last week, but it seems that only a few men participated. A new reduction of pay on the East Tennessee, Virginia & Georgia, general throughout the system, has been ordered, to take effect Nov. 1. The announcement states that since the order of Aug. 25 announcing a reduction of salaries the earnings of the road have fallen off \$120,000 a month. The present reduction affects chiefly engine and train men. Ten per cent. will be taken from those receiving \$50 a month and upward, five per cent. from those receiving over \$30 and under \$50. A meeting of employees of the Maine Central appointed a committee the other day to confer with the General Manager about the rightfulness of a reduction in wages which had been made, but the General Manager refused to receive them, demanding that they take his word for it that the reduction was necessary. If employees long acquainted with him did not wish to do this they were advised to resign.

The Missouri State Railroad Commissioners have issued an order declaring that a regulation of the Chicago & Alton, requiring passengers at way stations to show tickets to gate keepers before entering cars, is unlawful, and the company is directed to rescind the regulation. The order says: "In the judgment of the Commissioners any person desiring to travel upon any road in this state is entitled to do so, provided he pays his fare, whether such fare be paid at a ticket office or to the conductor of the train, and any regulation to the contrary is unlawful." We did not suppose that even the Alton was rich enough to afford the luxury of gatemen at country towns in Missouri; but whether the barrier is in the



shape of a gate, or only a brakeman at the car step, the Commissioners are evidently determined to have no such stuck-up-ness in their domain. Besides the annoyance of the regulation, it causes, according to the order, a "largely increased liability of accidents to passenger trains, as by reason of the detention at stations caused by time consumed in examination of tickets, trains are obliged to run at a very high rate of speed in order to make their schedule time." This liability has been incurred for several years on the Whitewater Division of the Cleveland, Cincinnati, Chicago & St. Louis, where passengers have been required to purchase tickets even if it hindered the train a little; but we have never heard of any disastrous results from the practice. But the Superintendent of the Whitewater Division had better not move his road into Missouri; he would be in hot water and his admirable plan for reducing the proportion of cash fares would be "in the soup."

#### NEW PUBLICATIONS.

*The Nebraska City Bridge.* A report to Charles E. Perkins, President Chicago, Burlington & Quincy Railroad Co. By Geo. S. Morison, Chief Engineer.

The careful illustrations, the completeness of the narrative and the thoroughness of the description of details with which Mr. Morison's reports on the bridges built by him are always got up are familiar to those who are interested in this part of the literature of engineering. The report on the Nebraska City bridge is not so full as those on some of the larger bridges which he has built, the bridge being one of comparatively minor importance, regarded simply as an engineering work.

The charter under which the bridge was built was granted by Congress in 1872, to the Nebraska City Bridge Company, but it contained an unusual provision for its transfer to any other corporation in the event of its not being used by that company. A location for a bridge was made in 1872 by Gen. W. W. Wright, and Nebraska City voted 10 per cent. bonds to the amount of \$100,000 to build a railroad and wagon bridge. In 1873 \$60,000 of these bonds were burned in the presence of the council, mayor and trustees, the proceeds of the other \$10,000 being used to pay the expenses incurred.

In 1886 Mr. Morison visited Nebraska City and set on foot an accurate survey of the river, under Mr. Addison Connor, the conduct of the river at that place being very fickle and requiring careful measures for its control. In 1887 he began the construction of a dike to preserve the channel, this work being under Mr. B. L. Crosby, as Resident Engineer, Mr. Connor continuing in immediate charge, and in April of that year Mr. Morison submitted plans for a bridge to the Secretary of War for approval. The plans were approved with the stipulation that the bridge should be raised two feet higher than had been intended, making it now 53.33 ft. above the standard high water of the Missouri River Commission. In June of the same year Mr. Crosby, as Resident Engineer, established his headquarters at Nebraska City and took charge of the work. The framing of the caisson for Pier I. began Aug. 13, and this was the beginning of the actual construction of the bridge. Mr. Morison being out of the country from the middle of November, 1887, to the end of the following April, Mr. E. L. Corthell who was then Mr. Morison's partner in business, had supervision of the work, acting as Associate Chief Engineer from May, 1887, to April, 1889. The last span was swung June 8, 1888, and regular trains began using the bridge Aug. 12 of the same year. The actual time from framing of the first timber to the opening of the bridge to general traffic was one day less than a year. In 1891 the bridge was opened for highway traffic, the floor of the main bridge having been planked and a highway trestle approach having been built.

This is a single track railroad bridge with two through spans of 400 ft. each and one deck span of 325 ft. The highway traffic uses the same roadway as the railroad, the bridge being closed to one class of traffic while the other is crossing. The Kansas City, St. Joseph & Council Bluffs Railroad on the east connects across the bridge with the Nebraska Railway on the west.

The substructure consists of one iron cylinder pier, two masonry piers and one abutment. The iron cylinder pier is designated as Pier I., the two masonry piers as Piers II. and III., and the abutment as Pier IV. Piers II. and III. are founded on pneumatic caissons 54 ft. long 24 ft. wide and 15 ft. high, the caisson of Pier I. being smaller. On the top of the caisson of Pier I. is a cribwork 45 ft. high, rectangular, with a side batter of 1 in 24. Piers II. and III. have cribwork 13 ft. high and 15 ft. high respectively, both having the corners cut off, and having a side batter of 1 in 24. The caissons and cribwork are filled with concrete; they rest on limestone rock, which was found to be 30 in. thick and to rest on clay or shale. The foundations of Piers II. and III. are 63.4 ft. below standard high water, and from the lower edge of the caisson to the top of the coping is 113.6 ft. The three pneumatic foundations cost \$72,899.87, exclusive of freight charges, and \$81,053.51 including the freight charges. The stone for the masonry is mostly limestone from Mankato, Minn., but the dimension work, wherever exposed to the frost, is granite from Morton, Minn. The cost of masonry per yard was \$23.24 for Pier II., \$28.01 for Pier III., \$24.72 for Pier IV.; average, \$26.99.

The entire superstructure, except a few small details,

is of steel. The iron and steel in the two through spans weighs 2,221,600 lbs., in the deck span it weighs 755,488 lbs. The total cost of the superstructure was \$183,305.57.

The protection work—or, more properly, the rectification work—consists of a dike on the east side of the river raised to about 1 ft. above the high water of 1881, the foundation being a woven willow mattress 125 ft. wide. On this was built a riprap dike containing 4,790 tons of stone. After the completion of the dike further ripraping was done, consuming 13,615 tons of stone, the total cost of the dike work being \$54,181. In 1889 the protection work was carried 4,000 ft. farther up the stream by the United States Government.

The total cost of the bridge, including the cost of a portion of the protection work, was \$582,700.87. The contractors were: T. Saulpaugh & Co., for masonry; Union Bridge Co., superstructure, and Baird Bros., erection.

*A Handbook to Various Publications, Documents and Charts Connected with the Rise and Development of the Railway System; Chiefly in Great Britain and Ireland.* Compiled by S. Cotterell. Birmingham: Edward Baker, 14-16 John Bright street. 1893. Pages 128, 12mo. Price 1 shilling.

Last March we announced Mr. Baker's little handbook as being in preparation, and, being already somewhat familiar with the scope and quality of his collection, we were prepared to find this more complete catalogue particularly interesting. It appeared early in the summer and contains the titles of 417 lots ranging from large and important books to odd pamphlets, magazines and maps. The collection is intelligently annotated by Mr. Cotterell, and aside from its importance to collectors it has much interest to even a superficial student of railroad development.

The pamphlet is divided into five sections, of which the first deals with the earlier suggestions for a railroad system, and with the curious fragmentary and ephemeral literature which those suggestions brought out. The second section covers the history of construction; and the third, history of lines. These include accounts of early suggestions for bridges, earthworks, signals, etc., and records of the early days of the existing lines, including guides and maps. In the second section we find the title of Nicholas Wood's valuable and interesting treatise, first published in 1825, which ran through several editions; also Tredgold's *Railroads and Carriages*, of the same year, and David Stephenson's *Sketch of Civil Engineering of North America*, 1838. These are but two or three of a remarkably interesting list of titles. In the third section appears the original bill for the Birmingham & Gloucester, the survey for which is said to have been Brunell's first work. On this was the Lickey incline, which Brunell and Stephenson declared that it was impossible to ascend with locomotives, and for which bogie engines were ordered from Norris, of Philadelphia. The steepest grade appears to have been but 143 ft. to the mile, which does not appear so impracticable to the engineers of a little later period.

The fourth section of the handbook is devoted to locomotion, in which we find many curious as well as important works. Among these is a translation into French of the "Manual" of Oliver Evans, 1821, Sylvester's Report on Railways, being the result of his examination of Stephenson's locomotives, 1825; several editions of Lardner on the Steam Engine, and Pambour's Treatise on Locomotive Engines, 1836, etc. The fifth section is devoted to early works on railroad finance and law, descriptive lists of early railroads and locomotives, old magazines, etc.

*Aeronautics.* New York: American Engineer and Railroad Journal, 47 Cedar street. Vol. I., No. 1, October, 1893. Price, 10 cents a copy; annual subscription, \$1.

The papers presented at the International Conference on Aerial Navigation during the Engineering Congress at Chicago were placed at the disposal of Mr. M. N. Forney for publication in the *American Engineer and Railroad Journal* if he saw fit. It has been decided, however, to publish them in a separate form as a supplement to that journal and under the title given above. This will appear every month and will contain not less than eight pages, and will give the proceedings in full of the Aerial Navigation Congress.

#### TRADE CATALOGUES.

*The Chautauqua Sewage System.*—The Bonnot Company, of Canton, O., has just issued a little pamphlet describing the very interesting sewage disposal system put in operation at the grounds of the Chautauqua Assembly the last season. Mr. W. B. Landreth, C. E., of Jamestown, N. Y., secured a contract last winter for doing this work, the masonry and machine house having been built by J. W. Willard, of Jamestown, and the machinery built and furnished by the Bonnot Company. The plan comprises a machine-house and four masonry settling tanks. The heavier particles are separated from the inflowing sewage in the machine-house by a screen, raked off and burned under the boiler. The chemical mixing vats hold 850 gallons of solution from which the sewage is treated by a milk of lime solution and a sulphate of ammonia solution. After this treatment the sewage passes into a brick mixing well, from which it is lifted by a vertical centrifugal pump and discharged again into the main channel, by which it passes to the

tanks. The sludge accumulating in the tanks is pumped back to the machine-house, where is a 60-cell Bonnot hydraulic press in which the sludge is submitted to a pressure of 60 lbs. to the square inch. The cakes produced are 30 in. in diameter and 1½ in. thick, weighing, when thoroughly dried, about 12 lbs.

#### Railroad Matters in Chicago.

*Passenger Traffic.*—It is generally believed that the aggregate number of passengers carried by the Chicago railroads the past week was as large as, if not larger than, during any preceding week the current year. For various reasons, however, some lines had an inconvenient excess of business, while the capacity of others was not fully employed. For example, the lines through Indiana brought thousands of extra passengers to celebrate that state's day at the World's Fair. Their regular local and through business was also very heavy, and the officials estimate that they carried more people the closing week in September than ever before passed over their roads in an equal number of days. This was especially the case with the Louisville, New Albany & Chicago, Chicago & Eastern Illinois, Big Four, B. & O. and the Pennsylvania systems. The traffic of the other Eastern lines was also equal to any preceding time, and the Michigan Central had about as much business as it could handle with comfort and economy.

A representative of the Chicago & Northwestern said: "There is no let-up to travel over any part of the Northwestern system. Visitors to the World's Fair from every point on our line seem to increase rather than diminish. The local traffic is surprisingly large, and our regular through business also compares well with that of any corresponding period, hence we have no idle passenger equipment, and increased patronage would necessitate extra exertions to accommodate it. It is useless to talk of lower rates while we have all the business we can conveniently do, and the reduction for Chicago Day at the Fair is simply a gratuity to visitors on that occasion. The St. Paul people said: 'Passenger business has kept up well; we are hauling as large a daily average of people as at any previous time, if not larger, and our advices from the sections whence the majority of visitors to the Exposition have come indicate that with good weather the present volume of such traffic will be maintained until near the close of October. It is true we could haul a few more people, but our equipment is well employed.' The Burlington officials said: 'We have no reason to complain about passenger business. The footings of the week just closed may not show as large an aggregate number of people brought to and taken from Chicago as the preceding one, when the attendance at the Exposition was greatly augmented by the celebration of Iowa Day, but our coaches have all been in use and well filled. The legitimate passenger traffic of the road, i. e., that not dependent on the Fair, is also as good as could be expected, and in some sections better. The September returns of the passenger department will make a good exhibit in the earning statement, although it promises to show the lowest rate per mile for hauling passengers that ever appeared in a monthly statement of the company. In brief, the road has handled an enormous number of people to secure moderate profits.' The General Manager of the Chicago, Rock Island & Pacific system, when asked in regard to the passenger traffic, said: 'The footings for the week are not yet made up. I think that they will show a slight decrease, as travel has been more erratic. There was a falling off on the Southwestern Division due to the subsidence of the 'Cherokee Strip boom.' On the whole, however, we are doing very well.' The Chicago & Alton officials were not very enthusiastic regarding business, which they said was good, but by no means rushing. Nor were they disposed to credit the Fair with more than a moderate percentage of their traffic. On the reverse the Illinois Central reported a large business, but no material change from the week immediately preceding, except their local, which was very heavy. The Atchison, Topeka & Santa Fe people said they were very well pleased with their business, as their earnings from through and local passengers were good. They also looked for a continued heavy travel through the current month. It was stated in another quarter that the Santa Fe is bringing a large number of merchants and business men here from Northern and Central Texas. These visitors have a double object, namely, to see the Fair and to buy goods and obtain a more intimate knowledge of Chicago and her methods of doing business here. It is proper to state in this connection that the extensive connections of the Santa Fe in Northern Texas have induced its officials to make extra efforts to secure the results above stated.

*Freight Traffic.*—The outward freight shipments over the Western railroads made a further increase the past week, and were larger than any preceding week in months. The bulk of the business consisted of merchandise. The outward coal tonnage noted in last week's letter was also increased by a drop in the temperature which stimulated an unlooked for demand, especially for anthracite. Officials of roads traversing the bituminous coal producing sections of Illinois, Iowa and Kansas report a large increase in the demand for coal cars, and owing to the fact that many of the mines were closed the greater part of the summer the miners' bins are empty, and operators unable to supply the current



demand, and the advent of autumn finds unusually scant supplies at all points in the West and Northwest.

The grain traffic, while large, was not up to the preceding week, or the corresponding one in 1892. There was, however, an increase in miscellaneous freight which aggregated 49,800 tons against 35,679 tons the closing week in September, last year. Hence the railroads, while not able to show as large freight earnings for September as for the corresponding month last year, are able to make a much better exhibit than given in the August reports. As far as can be learned any decrease that appears in the September balance sheet will be largely compensated by reduced operating expenses. It is also claimed that the expense account of all the leading roads will be kept within the lowest possible limit the remainder of the year, which is a bad outlook for the supply men.

The following shows the amount of flour and grain delivered at Chicago by each of the railroads mentioned during the week ending Sept. 30 and the same time in 1892:

By—	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
C. & N. W.	Bbls. 15,123	Bush. 1,313,000	Bbls. 15,929	Bush. 1,118,000
Ill. Cent.	8,250	1,053,000	250	1,177,000
C. & R. I. & P.	19,650	953,000	3,875	852,000
C. & B. & Q.	9,554	1,573,000	19,507	2,825,000
C. & Alton	10,800	438,000	6,243	477,000
C. & E. Ill.	300	106,000	125	414,000
C. & M. & St. P.	17,700	861,000	20,550	952,000
Wabash.	750	304,000	4,210	261,000
C. & G. W.	21,867	215,000	30,429	619,000
A. T. & S. Fe.	2,358	344,000	180,000	1,000,000
L. N. A. & C.	.....	26,000	833	1,000
Totals.....	109,333	7,186,000	101,951	9,088,000

The following shows the amount of flour and grain delivered at Chicago by each of the undermentioned railroads during the month of September, 1893, and the corresponding period in the year immediately preceding:

	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
C. & N. W.	Bbls. 47,259	Bush. 4,317,000	Bbls. 59,008	Bush. 4,537,000
Ill. Cent.	18,503	4,084,000	1,575	4,305,000
C. & R. I. & P.	74,050	3,772,000	16,375	4,216,000
C. & B. & Q.	51,106	7,091,000	89,005	8,312,000
C. & Alton	46,050	1,625,000	53,397	1,619,000
C. & E. Ill.	2,138	616,000	275	1,505,000
C. & M. & St. P.	70,250	3,099,000	82,300	3,356,000
Wabash.	2,700	1,356,000	38,005	1,304,000
C. & G. W.	69,429	751,000	118,842	2,031,000
A. T. & S. Fe.	9,596	1,378,000	875	1,936,000
L. N. A. & C.	.....	125,000	883	164,000
Total.....	391,481	28,214,000	463,490	33,395,000

The receipts of live stock for the week presented little change from the same time last year, cattle showing a decrease of 17,400 head while hogs and sheep increased 26,000.

CHICAGO, Oct. 2.

#### TECHNICAL.

##### Manufacturing and Business.

The Riehle Brothers' Testing Machine Co., of Philadelphia, reports indications of an improvement in business. Among recent orders they report a 20,000-lb. horizontal testing machine, a 10,000-lb. vertical screw power testing machine, a canvas testing machine for the United States Government, warehouse and railroad trucks for export, and numerous smaller machines.

James Stewart & Co., engineers, of Buffalo, N. Y., are preparing plans for a large storage warehouse for lake freight, to be built on the site of the old Chicago transfer elevator in that city. The building will be 300 x 200 ft. and 146 ft. high, and will cost about \$400,000. The new Eastern elevator, on the Buffalo River opposite Washington street, Buffalo, is nearing completion, 1,100 men being at work upon it. This building will be 165 ft. high.

The Philadelphia office of Randolph & Clowes has been removed from 333 Walnut street to 423 Chestnut street, the Philadelphia Bank Building, room 320.

Alexander Brown, of Baltimore has secured the contract for building a new coaling platform pier, 395 ft. long and 50 ft. wide, with trestling, at Canton, for the Philadelphia, Wilmington & Baltimore.

James W. Tyson, Jr., has been appointed Receiver of the Cold Rolled Steel Co., whose plant is located at Kensington, Pa.

The firm of Carlile & Weitbree, of Pueblo Col., well-known railroad contractors in the West, who have carried out some of the most extensive contracts on railroads and water works in Colorado and neighboring states for many years past, is to be dissolved, James M. Carlile and L. F. Carlile retiring. The contracts of the firm will be carried out by the remaining partner, R. F. Weitbree, of Pueblo.

At a meeting of the stockholders of the National Switch & Signal Works on Sept. 29, the directors were authorized to proceed with the work of completing the new buildings at Odenweldertown, Pa. It is expected that the buildings will be ready for occupancy next spring.

The Gold Car Heating Co. has an order from the Erie & Wyoming Valley Railroad to equip all the passenger

cars of the road with the Gold storage system of car heating. The President's car is to be equipped with the duplex double-coil heater in connection with the Baker heater. The coupling to be used is Gold's straight port coupler, with automatic gravity relief traps.

Messrs. H. M. Thompson and Thomas B. Innes have formed a co-partnership under the firm name of Thompson & Innes with office at 115 Broadway, New York City. They have acquired business of the Manhattan Equipment Co., dealers in railroad equipment and supplies, and they will make a specialty of second hand equipment. Mr. Thompson was formerly Secretary and Treasurer of the Brooklyn City Street Railroad. Mr. Innes has been engaged in the supply business for many years and has a very wide acquaintance among railroad men. He has been Manager of the Manhattan Equipment Co. for the last year or two and was formerly connected with the firm of Reginald, Canning & Co. The new firm will act as general agents for the American Wire Glass Manufacturing Co., manufacturers of a combination of glass and wire for train sheds and sky lights.

#### Iron and Steel.

Work was resumed on Oct. 2 in the Bessemer blooming and parts of the rolling departments of the Cambria Iron Works at Johnstown, Pa.

#### New Stations and Shops.

The Duluth, South Shore & Atlantic will shortly begin work on a roundhouse at Superior, Wis.

The Pennsylvania will soon begin the erection of a large office building in Erie, Pa., for the use of the Division Superintendent and the force under him.

The Shiffler Bridge Co., of Pittsburgh, has a contract to build new shops for the Ashtabula Steel Co., Ashtabula, O., including a main building 380 x 100 ft., with two wings 340 x 65 ft.; a blooming mill 420 x 60 ft., with two wings 240 x 20 ft., and several smaller buildings. The plant will include 20 boilers of 120 H. P. each. The Industrial Iron Works, of Bay City, Mich., will furnish the four electric traveling cranes.

The Canadian Pacific shops at Winnipeg are now in full operation. The shops are casting culvert pipes 30 in. in diameter and 6 ft. in length, each weighing over 2,000 lbs. Fifty four lengths are to be cast.

The Savannah, Florida & Western is building a freight transfer house 35 x 705 ft., at Waycross, Ga.

#### Car Lighting.

The Pintsch Company will have a gas works in operation in Boston in about 30 days, ready to deliver gas to the Boston & Maine, the passenger equipment of which will be lighted by that system. The Third Avenue cable cars, in New York, are also being equipped with Pintsch lamps, as is the case with the cars of the South Side cable road in Chicago. The two new elevated railroads in Chicago will also use the Pintsch system of lighting.

#### Iron Ore Shipments.

Iron ore shipments from the head of Lake Superior have been so far this year about 2,000,000 tons, of which the Gogebic, from Ashland, has shipped half, the Vermilion three-fourths, the smaller mines and the new Mesabi the rest. Shipments to the end of the season will probably be not far from 700,000 tons additional. The Duluth & Iron Range road is handling about 25,000 tons weekly, the Duluth, Missabe & Northern about 30,000, and the two Gogebic roads about 35,000 tons. In the past week two of the mines of the Marquette range have taken out their pumps, indicating an abandonment of operations for at least a year. Shipments from the Marquette, Menominee and Gogebic ranges will be sharply curtailed in 1894.

#### Flies and India Ink.

It is said that a little sulphate of quinine mixed with India ink will stop the annoyance of flies eating and blurring ink lines on tracings and drawings, and that the quinine will not injure the ink or the pen or the flies.

#### A Vacuum Regulator.

The Mason Regulator Co., of Boston, has recently made for a large Canadian sugar refinery a vacuum valve which is somewhat of a novelty. It regulates vacuum as the Mason reducing valve regulates steam pressure. By placing one of these valves in the exhaust pipe leading to the vacuum pump, any desired amount of vacuum may be kept in the chamber by simply adjusting the valve. This valve is valuable where different degrees of vacuum are desired in each one of a series of chambers, as in the triple-effect process of sugar refining.

#### New Electric Road on the North Side, Chicago.

A company called the North Chicago & Suburban Street Railway has been organized to furnish rapid transit to the north side and a number of suburban places adjacent. O. W. Meyenburg, President of the Siemens & Halske Electric Company of America, is at the head of the new enterprise, and associated with him are a number of prominent north side citizens and property owners. Details of the organization of the new corporation are withheld for the present, but it is probable that it will be capitalized with \$5,000,000. Many wealthy and prominent citizens have already pledged sufficient subscriptions to assure the capital, and there will be no trouble on the financial side, provided the requisite franchises can be obtained from the city council. Efforts will be made to secure a down-town terminal, though it will meet opposition from the cable lines. In the event that a down-town terminal cannot be ob-

tained at the outset, the end of the main line will be on Kinzie street, near Franklin street. The proposed route will be north on Franklin to Oak, thence over a part of Dayton street to Sheffield, Fullerton, North Ashland, Belmont and Lincoln avenues to Evanston, with branch lines to Irvin Park and Bowmansville. If the requisite municipal legislation can be secured in time, construction will begin next spring.

#### Two Important Decisions in Signaling Cases.

About three years ago the Union Switch & Signal Co. brought suit against the Johnson Railroad Signal Co. for infringement of their signal selector. The selector used by the Johnson Co. is claimed to be covered by United States Letters Patent granted to Mr. Henry Johnson. On Sept. 26 the case was decided in favor of the Johnson Railroad Signal Co. by Judge Greene, in the United States Circuit Court, District of New Jersey. J. Snowden Bell is counsel for complainant, while Edwin H. Brown and George W. Miller are counsel and Edward S. Savage is solicitor for defendant. The case entailed the construction of expensive models, and the taking of a great amount of expert testimony before referees.

Judge Acheson sitting in the United States Circuit Court, at Pittsburgh, Pa., made a decision Oct. 2 in the case of the Johnson Railroad Signal Company against the Union Switch & Signal Company in the matter of the use of the Sykes patents. The title of the Johnson Company to these patents is confirmed and as there is evidence of infringement and threatened infringement by the Union Switch & Signal Company, an injunction is granted and an accounting must be rendered for certain work already done.

#### THE SCRAP HEAP.

##### Notes.

The new car shops of the Penn Gas Co. at Penn, Pa., which are to take the place of the buildings destroyed by fire recently, will be completed by Jan. 1, 1894.

Severe rainstorms in New Mexico last week did much damage to the roadbed of the Atchison, Topeka & Santa Fe. Through trains were discontinued for several days.

Mr. C. O. Chenault, Pullman car conductor, running between New Orleans and Washington, has worked for his present employer 23 years, and has been on this route 20 years.

The "State Legislative Board of Railroad Employees" held its Second Annual Convention at Newark, N. J., Sept. 28. This organization claims to represent 20,000 railroad employees.

A fire in the car shops of the Louisville, New Orleans & Texas at Vicksburg, Miss., on the night of Sept. 27, burned the paint shop and several other buildings, and about 100 freight cars, the total loss being estimated at \$150,000.

A new edition of the railroad map of Pennsylvania has just been issued from the Department of Internal Affairs by J. Sutton Wall, who prepared one several years ago. Every railroad line and postoffice in the state is shown.

Marion Hedgepeth, one of the Glendale (Mo.) train robbers, was sentenced at St. Louis last week to 25 years' imprisonment. Two youths were sentenced to two years' imprisonment at Macon, Mo., last week for trying to derail a passenger train.

The Pittsburgh, Fort Wayne & Chicago now runs trains by the block system on the Western division. This division is 279 miles long, Crestline to Chicago, and about 60 miles of it is double track. Forty-five additional operators have lately been put on for this purpose. The Eastern division has had the block system for sometime, being all double track.

Railroad employees in Ohio are seeking support for two laws they want enacted. One is to require railroads to pay their employees weekly instead of monthly, and the other is the Indiana law regulating the liability of railroads in case of accidents to employees. They will also try to have a law passed requiring railroads to place not less than two brakemen on all passenger trains.

The City Solicitor of Philadelphia has begun suit for an injunction to prevent the Philadelphia & Reading using its new Market street passenger station until it shall have complied with certain provisions concerning grade crossings, which were attached to the ordinance under which the station was built. The principal point at issue is the construction of a bridge where the railroad crosses Broad street, and there has been a disagreement as to whether the railroad should go above or beneath the street.

The Southern Pacific is equipping its passenger cars, running in the local trains to and from the Oakland terminus, with screen doors to prevent passengers getting on to the steps except by permission of the trainmen. The suburban trains running to this ferry terminus pass through the streets of the city, and, in accordance with a peculiar provision in the charter of the road, large numbers of people have for years ridden without paying fare, the trains being obliged to run slowly, so that they can board the cars at any point they see fit. The screens are apparently designed to stop this little game.



**Bonds Listed.**

The following railroad bonds have been listed at the New York Stock Exchange:

Lake Erie & Western.—\$300,000 second mortgage fives, making the total listed \$1,800,000.

New York, Ontario & Western.—\$250,000 refunding mortgage fives, making the total listed \$6,750,000. The bonds are a part of an authorized issue of \$20,000,000 for various purposes.

Evansville & Terre Haute.—\$323,000 first general mortgage fives, making the total listed \$1,721,000. Of the new issue the sum of \$46,000 was issued to discharge obligations heretofore incurred and \$277,000 for the same purpose and "for other corporate purposes."

**A Protest Against the Van Buren Street Bridge, Chicago.**

The West Chicago City Railway Company has filed a protest with Capt. Marshall, Corps of Engineers, U. S. A., against the construction of the bridge across the Chicago River near Van Buren street by the Metropolitan Elevated Railroad. The surface road claims that besides impairing navigation, it will endanger the walls of its new tunnel by the driving of piles 53 ft. away. The plans of the elevated road have been accepted by the city council, and there has been no objection till the street railroad entered its protest. The street railroad company claims to have spent \$1,000,000 in the construction of the tunnel, and wishes to prevent it from being exposed unnecessarily to harm.

**Mining Record.**

Although the probable output of all Lake Superior iron ore mines for 1893 is estimated at 55 per cent. of last year's shipments, the average production of the mines on the old ranges will probably not aggregate one-half of the ore mined in 1892. The new Mesabi range has had a wonderful development, and some of the mines on it are able to put ore on the cars at a less cost than any other mines ever opened. The following records are reported as lately made, each with one steam shovel: At the Missabi Mountain mine, in seven hours, 1,500 tons were loaded; at the Mountain Iron, in nine hours, 2,500 tons, and at the Biwabik, in 12 hours, 3,400 tons. It must be remembered that in all these instances the ore had been stripped by steam shovels before the mining commenced. But after that was done, which may be considered analogous to shaft sinking and the dead work, it was possible to average over 200 tons per hour. While it would be rash to say that this record will not be beaten, it is probably safe to say it has never yet been equaled. The ore mined was between .62 and .65 in iron and .026 and .035 in phosphorus.

**The "Centurion" in the Chicago River.**

The Chicago River is a part of the navigable waters of the United States, but the government has made no improvements in it, and so far has exercised very little control over either the stream or the conduct of commerce on it. Hence the river has been developed in conformity with the conflicting views of the shipping interests, and property owners on one side and the railroads, helped by those who have to cross the river or its branches, on the other. The net result has been a stream just large enough to allow the largest lake craft to pull through, or in some instances, to be pulled through.

As it has become certain that there would be 20 ft. of water through the lake channels, larger and larger boats have been built, all of which managed to get into the river and its branches until the arrival of the "Centurion," the 100th boat built at Wheeler's yard at Bay City. This boat is 370 ft. over all, 45 ft. beam and 26 ft. deep, though the draft cannot be much over 16 ft. She comes in chartered to take 155,000 bushels of corn from an elevator at Sixteenth street on the south branch, but could not pass the Wisconsin Central bridge even after a group of spring piles was pulled for her convenience. Then she started up the north branch, where, after threats of the law, the Northwestern Railroad bridge was opened and let her through, but she stuck in the North Halsted street bridge. There being no more branches the "Centurion" went back to the Illinois Central elevator, where she waited for the arrival of corn from Nebraska and Iowa, 155,000 bushels, being more than the Illinois Central elevators had in stock. The lake freighting interests held indignation meetings (tempered by hope) on her deck. Some believed that the owners could collect damages for their trips up the branches and their wait for corn; others that the government should compel the city of Chicago to remove all obstructions preventing the free navigation of the river. Another advised the people to visit the "Centurion" now, as this one effort would be the last to load in Chicago, but this advice was not acceptable and another told how in the past a 30,000-bushel schooner had made as much trouble as the "Centurion." But the larger vessels brought the lake freights down from the 15 cents that the big schooner received, to the 1½ cents that the "Centurion" will get.

She at last got away with 147,839 bushels, and now all of the lake interests are calling for the appointment of a government harbor master, with authority to compel drawbridge tenders to give vessels the same right of way they have in other streams.

**The Atchison Freight Thefts.**

Early in the year the Atchison, Topeka & Santa Fe Railroad Company, with the aid of a detective bureau, unearthed what was thought to be a great conspiracy to loot freight cars of valuable merchandise. The alleged miscreants were among the employees along the line from La Junta, Colo., to Albuquerque, N. M. The detectives secured a confession from a freight conductor named Crotty, who had been in the service of the company for less than a year and whose character locally was not of the best. By this confession a number of employees of good character and excellent reputation were implicated. Search warrants were issued and the homes of these men in La Junta and Trinidad were rummaged through and quantities of merchandise were said to have been secured. Several station agents and their wives were thrown into jail until they could secure bail, and consternation prevailed for some weeks. At the preliminary examinations many of the cases were dismissed and withdrawn, but upon the evidence of Crotty others were bound over to the district courts. Among the men arrested was one member of the Masonic fraternity and others of good local standing. The most intense feeling prevailed and the local press was strongly denunciatory of the methods adopted by the detectives in their efforts to make cases against the employees.

These cases were delayed from time to time, but, finally, last week the last one was tried, resulting in a failure to secure a single conviction. Some who had been found with quantities of goods in their possession were able to make a considerable show of innocence, and as the public sentiment was so strong in favor of the defendants, the result was the absolute failure of the company to secure a single conviction.

The evidence was morally conclusive in some cases, but the entire matter seems to have been handled unsatisfactorily. In the zeal of the detectives to make a great record, wholesale arrests were made and some innocent people were possibly apprehended. This enraged the friends of the employees and a whole summer of agitation gave all the innocent and guilty alike, an opportunity to escape punishment.

In dropping the few remaining cases, the district attorney said that in the light of public sentiment he deemed it unwise to attempt to prosecute any more cases. Crotty was removed to Pueblo for safe keeping, as talk of lynching was freely indulged in.

**The Greater New York.**

An enterprising gentleman has conceived the idea of putting a tail on Manhattan Island. He proposes to make ground by filling from the Battery about two miles south. The total area gained, including Governor's Island, will be 489 acres and will give 4.2 miles water front. Why he should not have made an acre more and called it 490, or even 11 acres and called it 500 we do not exactly know, but of course in such matters accuracy engenders confidence. Having got started on such a scheme there is no reason why one should stop. Therefore, a bridge is projected to go from Brooklyn right across to Governor's Island to the reclaimed and improved country south of Jersey City, or as the reporters say, "a mighty arm of iron and steel is to stretch across the North River." Of course the reader is familiar with the fact that this scheme will provide rapid transit for the south, east and west, at least 15 such schemes having been aired within the last five years. Figures are presented to demonstrate that this bridge and the rapid transit improvements connected with it will net the lucky man who jumps right in and builds it 15 per cent. a year on his investment. The estimated profit to the city after making this new land is, as near as we can make out, something over 86 million dollars.

**LOCOMOTIVE BUILDING.**

The Canada Atlantic has just received three locomotives from the Baldwin Locomotive Works, Philadelphia, one heavy freight mogul and two passenger locomotives. The following are some of the important measurements of the freight mogul: Cylinders, 19 x 26 in.; drivers, 57 in.; weight, 116,000 lbs.; weight of tender, 80,000 lbs. The passenger locomotives have cylinders 18 x 24 in.; drivers, 6 ft. in diameter; weight, 100,000 lbs.; weight of tender, 80,000 lbs.; the working pressure is 180 lbs., and the boiler is 64 in. in diameter.

**CAR BUILDING.**

The shops of the Jacksonville, St. Augustine & Indian River road have turned out a new office car for General Superintendent Crawford. The car is described by a local paper as "pretty, but not extravagant, perfect in utility, but not characterized by excessive elegance." It is a well-arranged combination of office, sleeping-room, toilet-room, dining-room and kitchen on wheels.

**BRIDGE BUILDING.**

Charlottetown, P. E. I.—The provincial government is calling for tenders, to be received up to Oct. 25, for building a bridge across South Lake, in Kings County, according to plan and specification to be seen at the residence of Daniel J. McDonald, South Lake, P. E. I.

Duluth.—There is urgent demand for a general traffic bridge between Duluth and Superior, and a sharp contest is in progress at Washington for a franchise. The Lake Carriers' Association, representing a tonnage trading to Duluth and Superior of a value of \$50,000,000, has endorsed a bridge which shall accommodate steam and electric cars, and wagon and foot passenger traffic. Another bridge, proposed by the street railroad interests and endorsed by the Congressmen, does not provide for steam traffic. The Vice-President of the Lake Carriers' Association writes to the Secretary of War on the traffic passing such a bridge, stating that in amount of dead weight tonnage the harbor of Duluth-Superior ranks now fourth or fifth in the United States, and that this traffic is rapidly increasing. Most of this tonnage will pass through a bridge at this point.

Elkton, Md.—Work has been commenced on the new iron bridge over Mill creek, three miles south of Elkton. The bridge will be 20 ft. long, 16 ft. wide and 6 ft. above water level. The work is being done by George McQuilkin, of the Enterprise Machine Works, of Elkton.

Harrisburg, Pa.—The Commissioners last week let contracts for two iron bridges, one across Powell's Creek, in Halifax Township, to R. A. Simmons, of Dauphin, for \$1,360; and another over Wicowisco Creek, in Williams Township, to Nelson Buchanan of Chambersburg, for \$1,700.

Lancaster, Pa.—Bids were opened Sept. 30 for the erection of a 104 ft. county bridge over Pequey Creek, near Intercourse. No contract was awarded that day.

Olympia, Wash.—The County Commissioners have let the contract for the construction of a wooden bridge across the Skookum Chuck River to F. D. Cotter.

Ottawa, Ont.—Contractor H. J. Beemer, of Ottawa, states that he is prepared to commence the construction of the St. Lawrence River bridge between Ottawa and Hull, provided the Dominion and provincial governments and cities of Ottawa and Hull give reasonable subsidies. Plans for the structure have been partly completed. It is to be of steel and includes a railroad, vehicle and foot passenger bridge.

Pittsburgh, Pa.—Messrs. Jennett have secured the contract for the bridge to be built for the Coraopolis & Neville Island Electric road, and connecting the west end of the island with Coraopolis. Their bid was \$45,000. Work was begun Oct. 2.

Red Wing, Minn.—It is proposed to build a steel wagon bridge across the Mississippi River at this point. The citizens, in public meeting favor the project, and a special election will be called soon to vote upon the proposition to issue bonds to aid the construction of the bridge.

Sanford, Fla.—The new drawbridge of the Jacksonville, Tampa & Key West Railroad over St. John's River at the foot of Lake Monroe was completed and put in use on Sept. 25. The draw of this bridge is a steel Pratt truss 230 ft. long. The contractors, J. M. S. Carter & Co., of St. Louis, are also building bridges for this road at Black and McGirt's creeks.

Sunbury, Pa.—The Grand Jury has approved petitions for county bridges across Shamokin Creek; across Greenbrier Creek, in Washington Township; across Big Mah-

noy Creek, in Cameron Township; across Plumb Creek in Rockefeller Township; across Little Roaring Creek, between Rush Township and Mayberry Township, Montour County; across Snufftown Creek, in Shamokin Township; across Mahanoy Creek, in Little Mahanoy Township; across Hollowing Run, in Lower Augusta Township.

Wellsville, Pa.—The County Commissioners will build bridges over Beaver Creek and over the North Branch in Warrington Township and across Doe Run at this point.

Wilkes Barre, Pa.—The large viaduct of the Wilkes Barre & Eastern over Panther Creek has been completed. It is over 1,600 ft. long and 163 ft. high.

**MEETINGS AND ANNOUNCEMENTS.****Dividends:**

Dividends on the capital stocks of railroad companies have been declared as follows:

Concord & Montreal, 1½ per cent., payable Nov. 1.  
Delaware, Lackawanna & Western, quarterly, 1½ per cent., payable Oct. 20.  
New York Central & Hudson River, quarterly, 1½ per cent., payable Oct. 16.

**Stockholders' Meetings.**

Meetings of the stockholders of railroad companies will be held as follows:

Alabama Great Southern, annual, Birmingham, Ala., Oct. 18.  
Atchison, Topeka & Santa Fe, annual, Topeka, Kan., Oct. 26.  
Boston & Maine, annual, Lawrence, Mass., Oct. 11.  
Cleveland, Cincinnati, Chicago & St. Louis, annual, Cincinnati, O., Oct. 25.  
Concord & Montreal, annual, Concord, N. H., Oct. 10.  
Denver & Rio Grande, annual, Denver, Col., Oct. 17.  
Evansville & Terre Haute, annual, Evansville, Ind., Oct. 16.  
Great Northern, annual, St. Paul, Minn., Oct. 12.  
Illinois Central, annual, Chicago, Oct. 18.  
Louisville & Nashville, special, Louisville, Ky., Nov. 8, to vote on an increase of the stock to \$60,000,000.  
Manhattan Elevated, annual, New York City, Nov. 8.  
New Orleans & Northeastern, annual, New Orleans, La., Nov. 1.  
New York, New Haven & Hartford, annual, New Haven, Conn., Oct. 18.  
Northern Pacific, annual, Mills Building, New York City, Oct. 19.  
Pullman's Palace Car Co., annual, Chicago, Oct. 19.  
St. Louis & San Francisco, annual, St. Louis, Mo., Oct. 24.  
St. Paul & Duluth, annual, St. Paul, Minn., Oct. 12.  
Spokane Falls & Northern, annual, Spokane, Wash., Nov. 13.

**Technical Meetings.**

Meetings and conventions of railroad associations and technical societies will be held as follows:

The American Railway Association will hold its fall meeting at the Grand Pacific Hotel, Chicago, Oct. 11.

The American Association of Railroad Superintendents will hold its next meeting at the Grand Pacific Hotel, Chicago, Thursday, Oct. 12.

The International Association of Railroad Superintendents of Bridges and Buildings will hold its third annual meeting at the Continental Hotel, Philadelphia, Pa., Oct. 17, 18 and 19.

The Western Railway Club meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The New York Railroad Club meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7.30 p. m.

The Northwest Railroad Club meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except June, July and August, at 8 p. m.

The American Society of Civil Engineers meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

**American Society of Civil Engineers.**

At the meeting to be held on Wednesday evening, Oct. 18, a paper will be presented on the subject of "Railroad Location," by Michael L. Lynch, M. Am. Soc. C. E.

This paper begins with the statement that fixed or inflexible rules for location cannot be laid down, and the author believes that a discussion of the general principles involved in the best modern practice is the most practical way in which to treat the subject. He takes up first the reconnaissance for a proposed railroad and assumes a case where it is desirable to connect two cities 250 miles apart with a line of railroad, which it is necessary or desirable should pass through several intervening towns. As a preparation for the reconnaissance, which is the first thing in order, the best general map of the country, together with detail, county and township maps, should be procured. Usually, the general map will show the existence of two or more possible routes, and afford a knowledge of the drainage of the country, with which the engineer must be thoroughly familiar. He can also approximately determine where to expect the steepest gradients, as the divide between two main drainages is never equidistant between the streams; the nearer the divide to one of the streams, of course the steeper the slope on that side. In this connection the writer says that where a stream flows east or west, the south slope of the valley is generally steeper, rougher and more broken than the north slope, the latter being the smoother slope and with the gentler ascent out of the valley. Where a stream flows north or south, the east slope of the valley is invariably steeper, rougher, and more broken than the west slope. In other words, the engineer will find it more difficult to get a line down the valley from the south in the first case, or from the east in the second. This remark applies even on a large scale, as the Pacific slope is much steeper, more abrupt, rugged and broken than the eastern slope of the continent.

A leveling instrument is most needed in determining the feasibility of surmounting certain difficulties at governing points, and the writer uses for this purpose a small hand level, with sights like a surveyor's compass, and a graduated vertical arc which can be set to any gradient desired, to determine whether the maximum gradient is practicable along a given slope, and the approximate depth of a summit cut.

A thorough reconnaissance, when carefully plotted and sketched in, would be quite a surprise to one not familiar with this class of work, as the lines run with a hand compass, and the distances determined by the time of a well-gaited horse, give quite accurate results. Such a reconnaissance should always be made before starting



the instrumental preliminary and location surveys, otherwise the best line in the country may be overlooked.

The next thing in order, after the reconnaissance, is the organization of the party or parties to run the preliminary lines and fix the final location. In thickly settled sections of country the bad practice is sometimes adopted of starting the party out without a camp outfit, providing for their subsistence and accommodation at farmhouses along the line. This is a one-horse arrangement, and cannot be too strongly condemned. A properly equipped party should not have less than three good teams and wagons, and the teams, in addition to moving the camp, should carry the lunch to the men at noon and take them to and from their work. Of course, the preliminary survey should be run as close to the final location as is possible, the chaining should be carefully done and all angles run with the transit; in other words, the survey should be accurately run as the location is built upon it, and inaccuracies here are sure to cause trouble afterward. This also applies to the work of the topographer, who should sketch accurately the contours, location of streams, buildings, etc., and should use the tape line and slope level, so as to make the map accurate for several hundred feet on each side of the line.

For such a survey several preliminary and spur lines may have to be run, and, although the progress may be slow, it is nevertheless good practice to thoroughly develop the country by such preliminary lines before deciding on the final location. Many roads are to-day suffering from the effects of mislocation, caused by forcing the engineer on this portion of his work and not giving the necessary time for proper preliminary examination. The result is an increased cost of maintenance, and an increase in the operating expenses due to moving trains over steeper gradients than are necessary.

As a rule, one mile a day of finished located line is a fair average for the time to be occupied for preliminary and location surveys in an ordinary country, partly timbered and partly open; in broken country less, and in smooth country more.

The preliminary lines having been completed, tangents and curves of the proposed location should be first projected on the carefully prepared topographical map before proceeding to locate them in the field.

In this day of rapidly increasing speed it is desirable that reverse curves should not exist. Transition curves may be considered a necessity where the curves are at all sharp. "Broken back" curves, as they are called, that is to say, two curves in the same direction with a short stretch of tangent between them, should be avoided; a single curve covering the ground and eliminating the tangent can usually be found with a little extra labor.

In compensating a gradient for curvature it is generally conceded that 0.04 ft. per station per degree of curve is about right, and at the junction of two gradients on a summit or the bottom of a depression, it is very necessary to round off the vertical curves. A simple rule adopted by the author is given by an example, thus: where an ascending grade of  $1\frac{1}{2}$  per cent. passes over a summit to a descending grade of 1 per cent., the ordinate of a curve connecting the two can be calculated by taking one-half the sum of the rate of grade per station, regardless of algebraic signs, as the ordinate of correction at the apex, one-fourth of that ordinate as the correction of the first station, one-fourth of this last ordinate as the next correction, and so on. The absence of vertical curves at the foot of all steep gradients is a fruitful source of derailment.

#### Engineers' Club of Cleveland.

The meeting of Sept. 12 was called to order at eight o'clock by the President; 25 members and visitors present. Mr. Thos. D. West read a paper entitled, "Engineering, the Establishment of Competitive Manufacturing Enterprises," which was discussed by Messrs. Ludwig Herman, John Walker and Jos. L. Gobeille.

Prof. C. H. Benjamin read a paper entitled, "Experiments on the Elastic Strength of Steel Hoops," which was discussed by Messrs. Osborn, Searles, Gifford, Langley, Herman, Walker and West.

#### Montana Society of Civil Engineers.

At the last regular monthly meeting of the Montana Society of Civil Engineers, E. H. Beckler, Esq., late Chief Engineer of the Pacific Extension of the Great Northern Railway, was unanimously elected an Honorary Member of that Society. Mr. Beckler is the first member of the Society elected to honorary membership, and in conferring this honor the Montana Society did so in recognition of Mr. Beckler's high attainments as engineer, and especially in view of the high professional ability he displayed in the location and construction of the Pacific Extension of the Great Northern Railway, of which he was the Chief Engineer.

In the accomplishment of this great work he secured a route through the main range of the Rocky Mountains with lower gradients than any other transcontinental line, the maximum gradient east of the summit being but 1 per cent., or 53 ft. per mile, and west of the summit 1.8 per cent., or 95 ft. per mile. The crossing of the Cascade Mountains is made with a maximum grade of 2.2 per cent., or 116 ft. per mile, and on a route so direct that the distance from Spokane, Wash., to Puget Sound is shortened 94 miles over any other route.

The location for most of the distance was through an unexplored and mountainous country, and the entire distance of 818 miles was completed in a little over two years from the time construction work was inaugurated.

In presenting Mr. Beckler's name to the Society Mr. John Herron said:

"I take pleasure in nominating Mr. E. H. Beckler for election to honorary membership in this Society, and also in being able at this time to bear testimony to the personal worth of the man we as a society desire to honor. He is known to all of us by the results of his energy and ability, but best known to some of us by that personality before which it was a pleasure to forget the dullness of daily routine and to look on work for its promises and possibilities. I speak for myself and my associates, who, as subordinates, were connected with Mr. Beckler in this work, when I say that whether in office or in camp, in civilization or in the wilderness, he was the same, a leader always, but a leader men would follow because his counsel meant encouragement and his friendship was not limited to time or place. . . . It does seem to me eminently fitting this evening that we, as members of the Montana Society of Civil Engineers, place on record not only our conviction, but our pride, that the honor of these great engineering works belongs to a member of our Society."

#### Railroad Surgeons.

The Southwest Association of Railway Surgeons will meet in St. Louis Oct. 26. This association includes the railroad surgeons of Missouri, Arkansas, Kansas, Texas, Indian Territory, Colorado, Tennessee, Kentucky, and Illinois. Dr. Frank J. Lutz, of St. Louis, is President, and Dr. C. M. Lutterloh, of Jonesboro, Ark., Secretary.

#### PERSONAL.

—Mr. P. Ryan has been appointed Superintendent of the Kalispell Division of the Great Northern with office at Kalispell, Mont., vice I. P. Welles, resigned.

—Mr. D. J. T. Oldham has resigned his position as New England representative of the Safety Car Heating & Lighting Co., and will engage in business in New York City.

—Mr. Harry L. Flanders, late Division Superintendent of the Missouri Pacific at Little Rock, Ark., has been appointed to a position as Division Superintendent on the Mexican Central with office in the City of Mexico.

—Gen. Peter C. Doyle was last week appointed Collector of Customs for the Buffalo district by President Cleveland. General Doyle has been connected with the traffic department of the Lehigh Valley at Buffalo for some years as General Northern Freight and Passenger Agent.

—Mr. E. B. Pleasants has been appointed Engineer of Roadway for the Wilmington & Weldon and the other roads operated by the Atlantic Coast Line system. He succeeds the late B. R. Dunn. Mr. E. B. Pleasants has been connected with the system for about five years as an engineer in the construction department.

—Mr. Abraham D. Locke, who has been connected with the construction of several short roads in Texas and other Western states in the last few years, as contractor, died at his home at Jerseyville, Ill., on Sept. 29. He was at one time Secretary of the Maricopa & Phoenix road in Arizona, and later Secretary of the Bridgeport & Decatur in Texas, and other small companies.

—Mr. Theodore S. Lindsey, Paymaster of the Lake Shore & Michigan Southern, has resigned on account of his increasing age. It is understood that he will remain with the company in an easier position. Mr. Lindsey began as conductor, on one of the roads now forming the Lake Shore, in 1853. He was subsequently a Division Superintendent and became Paymaster in 1870.

—Mr. Henry F. Whitcomb and Mr. Howard Morris were last week appointed Receivers of the Wisconsin Central. Mr. Morris is a Director of the company and its counsel and Mr. Whitcomb was for many years General Manager of the Milwaukee, Lake Shore & Western. He was appointed General Manager of the Wisconsin Central last week after the order of the United States Court directing the Northern Pacific to surrender the Wisconsin Central to its own directors.

—Mr. Henry F. Whitcomb, who was appointed General Manager of the Wisconsin Central on the termination of the Northern Pacific lease of that road, and who a few days later was appointed one of the Receivers of the Wisconsin Central, has been in the railroad service in Wisconsin for many years. He was General Freight and Passenger Agent of the Milwaukee, Lake Shore & Western for 12 years, and General Manager of the same road for about eight years. He had charge of the building of a portion of that road.

—That very distinguished man Dr. Von Helmholtz has been in New York during the present week and has received some of the attention which his character and achievements deserve. Tuesday he delivered a lecture before the College of Physicians and Surgeons in New York City, President Low, of Columbia College, Doctor Alexander Graham Bell and other eminent gentlemen being present. Wednesday evening a reception in his honor was given at the Century Club and Thursday afternoon the students of Columbia College were asked to meet him.

—Col. Aldace F. Walker has resigned his office as Chairman of the Joint Committee, to take effect within the next 60 days. Prior to his appointment to that position, in December last, the business known as joint committee traffic, being through freight and passenger business between the Western States and the Atlantic seaboard, was handled through the Commissioners of the Trunk Line and Central Traffic associations. Chairman Walker states that those officers are adequately organized to carry on the joint business, so far as the same is controlled by existing rules, and that there seems to be no necessity for a Chairman of the Joint Committee in the absence of a more complete and efficient organization. He expects to return to the practice of law, probably in Chicago or New York, but is not yet prepared to state definitely where he will locate.

—The appointment of officers for the Wisconsin Central were announced last week, the most important changes from the former organization being the omission to make any appointments to the office of either Traffic Manager or General Superintendent. Mr. H. C. Barlow has held the former office since 1887, and continued in that position when the road was leased to the Northern Pacific and the offices removed to Chicago. Mr. Gavin Campbell, who has been General Superintendent for the last four years, was compelled to retire from that position a few months ago on account of ill-health. He is now residing at Montello and is confined to his room. Mr. Robert B. Tweedy is now Chief Engineer of the company, succeeding Mr. J. W. Kendrick, of the Northern Pacific. Mr. F. Y. Marsh and Mr. A. R. Horn continue as Division Superintendents, with headquarters at Waukesha, Wis., and Stevens Point, Wis., respectively. The other general officers have been reappointed.

—Mr. S. R. Ainslee continues in charge of the Chicago & Northern Pacific as General Manager.

#### ELECTIONS AND APPOINTMENTS.

**Altoona, Clearfield & Northern.**—S. P. Langdon, of Philadelphia, has been elected President, vice F. G. Paterson, and William E. Steen elected Secretary, to succeed H. J. Davis, with headquarters at Altoona, Pa.

**Atlantic & North Carolina.**—The directors, at their annual meeting held Sept. 28, elected W. S. Chadwick President, F. C. Roberts Secretary and Treasurer, and S. L. Dill Superintendent, all of Newbern, N. C.

**Boston & Albany.**—At the annual meeting held in Boston, Mass., Sept. 27, the following directors were elected: William Bliss, John P. Spaulding, Boston, Mass.; John Cummings and Edward D. Hayden, Woburn, Mass.; Edward L. Davis, Worcester, Mass.; Chauncey M. Depew, New York City; Zenas Crane, Dalton, Mass.; Edward B. Gillett, Westfield, Mass.; Samuel Hoar, Concord, Mass.; Moses Kimball and Charles S. Sargent, Brookline, Mass.; Jacob C. Rogers, Peabody, Mass., and James A. Rumrill, Springfield, Mass.

**Central of Georgia.**—E. F. Cunningham has been appointed Auditor of the Central Railroad & Banking Company of Georgia, the Mobile & Girard, the Montgomery & Enfield and the Savannah & Western railroads, in place of Milo S. Freeman, resigned.

**Chicago, Rock Island & Texas.**—L. G. Hastings has been elected Secretary and Treasurer, with office at Fort Worth, Tex., vice H. F. Weber.

**Cumberland Valley.**—At the annual meeting held in Harrisburgh, Pa., Oct. 2, the following directors were elected: Thomas B. Kennedy, Chambersburg; George B. Roberts, Philadelphia; J. Herman Bosler, Carlisle; Henry D. Welsh, A. J. Cassatt, J. P. Green, H. H. Houston, Philadelphia; W. W. Jennings, Harrisburgh; M. C. Kennedy, J. Stewart, Chambersburg, and Edward B. Watts, Carlisle.

**Delaware, Susquehanna & Schuylkill.**—The following are the present officers of this company: Eckley B. Coxe, President, Drifton, Pa.; E. B. Ely, Vice-President, No. 143 Liberty street, New York City; Arthur McClellan, Secretary; Daniel Coxe, Superintendent; H. J. Davis, Assistant Superintendent; E. Kudlich, Chief Engineer; George M. Hoffer, Traffic Clerk; all with offices at Drifton, Pa.

**Dubuque & Sioux City.**—At the annual meeting at Dubuque, Ia., Oct. 3, the following directors were elected: S. V. R. Cruger, Stuyvesant Fish, E. E. Gibson, New York; J. T. Harahan, J. C. Welling, Chicago; A. S. Garretson, Sioux City; E. C. Woodruff, New Jersey; S. H. Dows, Cedar Rapids; A. P. Loomis, Fort Dodge; John T. Hancock, C. W. Mitchell, J. V. Rider, W. H. Torbert, M. M. Walker and W. E. Harriman.

**Duluth, South Shore & Atlantic.**—The headquarters of the General Freight Department have been transferred from Marquette, Mich., to Superior, Wis.

**Fitchburg.**—At the annual meeting held in Boston, Mass., Sept. 27, the following directors were re-elected: Robert Codman, Boston; Rodney Wallace and Charles T. Crocker, of Fitchburg; George Heywood, Concord, N. H.; W. Seward Webb, New York; Francis Smith, Rockland, Me.; William H. Hollister, New York City; William A. Russell, Boston, and Edward C. Thayer, Keene, N. H. The following officers were re-elected: Henry S. Marcy, President; Daniel A. Gleason, Treasurer; Edmund D. Codman, Secretary, all of Boston.

**Jacksonville & Atlantic.**—R. V. Rogero has been appointed General Freight and Passenger Agent, with headquarters at Jacksonville, Fla., vice J. I. Munoz.

**Keokuk & Western.**—T. DeWitt Cuyler has been elected Vice-President, with office in the Drexel Building, Philadelphia, Pa., vice G. H. Candee.

**Lehigh Valley.**—A. A. Smock has been appointed Assistant General Passenger Agent, with headquarters at South Bethlehem, Pa.

**Millen & Southern.**—J. F. Gray has been appointed Superintendent and Treasurer, with office at Millen, Ga.

**New Orleans & Southern.**—George S. Taylor has been elected Secretary and Treasurer, with office at 34 St. Charles street, New Orleans, La., vice H. S. Bell, resigned.

**New York, Ontario & Western.**—The following directors were re-elected at the annual meeting held in New York City, Sept. 27: Thomas P. Fowler, Gerald L. Hoyt, Richard Irvin, John B. Kerr, William H. Paulding, Albert S. Roe and Eben K. Sibley, New York City; Francis R. Culbert, Newburgh, N. Y.; Harry Pearson, Joseph Price and Charles J. Russell, London, Eng.; Edward B. Sturgis, Scranton, Pa., and Charles S. Whelen, Philadelphia, Pa.

**Northern Pacific.**—John C. Bullitt, Jr., Advisory Counsel, has been appointed Attorney for the Lake Superior Division, with headquarters at Duluth, Minn.

**Reynoldsville & Falls Creek.**—John H. Bell has been appointed Superintendent, with headquarters at Reynoldsville, vice George Mellinger, resigned.

**Wellsville, Coudersport & Pine Creek.**—O. Duke has been appointed Treasurer, with headquarters at Wellsville, N. Y., vice H. N. Lewis, resigned.

**Wheeling & Lake Erie.**—E. W. Frink has been appointed Assistant Treasurer, with headquarters at Toledo, O., vice A. H. Thorpe.

**Wisconsin Central.**—H. F. Whitcomb, who was appointed General Manager on Sept. 25, announced the following appointments: J. B. Cavanaugh, General Freight Agent, with office at Chicago; J. C. McCutcheon, Assistant General Freight Agent, office at Chicago; James C. Pond, General Passenger Agent, office at Chicago; F. J. Hawn, Superintendent of Transportation, office at Chicago; T. C. Clifford, Superintendent of Dining and Parlor Cars, office at Chicago; Robert B. Tweedy, Chief Engineer, office at Milwaukee; James McNaughton, Superintendent of Motive Power, office at Waukesha, Wis.; William Cormack, Master Car Builder, office at Stevens Point, Wis.; John J. Callahan, Superintendent of Bridges and Buildings, office at Stevens Point; F. H. Marsh, Superintendent Chicago and Milwaukee Division, office at Waukesha; A. R. Horn, Superintendent Wisconsin, St. Paul and Ashland Division, office at Stevens Point, Wis. On Sept. 27 Judge Jenkins, of the United States Court at Milwaukee, appointed H. F. Whitcomb and Howard Morris Receivers of both the Wisconsin Central Company and the Wisconsin Central Railroad.

#### RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Albany Terminal.**—The construction of this connecting track at Albany has now been going on for some time, but, according to the reports of the local papers, it is not likely to be opened for traffic before Dec. 1. It is only about one and a half miles long, and is intended to connect the tracks of the New York Central & Hudson River Railroad, near the Tivoli Lakes in Albany, with the tracks of the Delaware & Hudson Canal Co., near the river front, and with new bonded warehouses. When completed it is to be operated by the New York Central & Hudson River road, and F. A. Harrington, Division Superintendent of that company at Albany, is one of the officers of the new road. The construction of the line is in charge of Walter Melius, Civil Engineer, of Albany.

**Astoria & Portland.**—W. H. Remington, of Salt Lake City, has informed the local committee at Astoria, Or., that he will be unable to carry out his agreement for building this road, having failed to complete the financial arrangements in the time given by the committee. A large subsidy was subscribed at Astoria for the extension of the Astoria & South Coast road south to Portland, Or. Several companies have been organized, but none has ever done enough work to earn any part of the



subsidy. Now that this last effort has failed the subscribers to the fund will be released from their promises and the railroad project abandoned.

**Boone Valley Coal & Railway Co.**—The short line to the coal mines in Boone County, Ia., controlled by Hamilton Browne, and the company of which he is the chief representative, is being built under the charter of the above road. The line now being constructed is only four miles long, but trackage rights have been secured over the Minneapolis & St. Louis from Pilot Mound to Dayton, Ia., eight miles. The new road extends from the mines at the new town of Fraser to Pilot Mound station on the Minneapolis & St. Louis. Connection is secured at Dayton with the Chicago & Northwestern. Most of the work is now finished, and it is expected that all the track will be laid soon after Oct. 15. The line has maximum grades of three per cent. and a maximum curvature of 16 deg. The following are the officers of the company. President and General Manager, Hamilton Browne, Boone, Ia.; Vice-President, Norman D. Fraser, Chicago; Treasurer, S. T. Merservey, Fort Dodge, Ia., and Secretary, Bruce B. Barney, Chicago.

**British Mexican.**—Work on this railroad from Jimenez station on the Mexican Central to the mining camp of Sierra Mojada, has been temporarily suspended. The line is owned by Coats & Co., the thread manufacturers of Scotland, who are the chief stockholders. The contractors are David Shaw & Co., of the City of Mexico. The route of the road is from the Jimenez station to Lake Jaco, a salt lake owned by the projectors of the railroad, and thence to Sierra Mojada, 180 miles altogether. About 40 miles of road is reported completed and rails for a portion of the line have been delivered. John E. Earley is Chief Engineer, his headquarters being at Jimenez.

**Brooklyn Elevated.**—The South Brooklyn extension of this road was opened for regular traffic on Oct. 1. The new line extends from the former terminus of the Fifth Avenue branch at Thirty-eighth street and Fifth Avenue, through Thirty-eighth street to Third Avenue, and thence along Third Avenue to Sixty-seventh street, a distance of about 1½ miles. About 6,000 tons of iron were used in erecting this structure, Coffrode & Saylor, of Philadelphia, being the contractors.

**Bucotouche & Moncton.**—This road has not been finished according to contract, and \$35,000 of the government subsidy has been withheld. Permission has been granted by the government to make other and more needed repairs in lieu of what the company was required to do under the original contract, to obtain this balance. The Bucotouche bridge will be thoroughly repaired. Iron piling will replace the wooden piles in the middle piers, and the entire road will be put in proper condition. It is expected the work will be finished this fall. The company operates about 30 miles of road in New Brunswick.

**Cleveland, Wooster & Muskingum.**—The extension of the road from Wooster south to Millersburg, O., 19 miles, has been graded to within two miles of Millersburg, and right of way is being secured for the remaining distance. It is expected to begin track-laying soon, although this work may be delayed until spring. McNair & Bracey, of Chicago, are the contractors for the work now under way. The road is operated by the Baltimore & Ohio.

**Columbus, Hocking Valley & Toledo.**—This road which has heretofore used the belt line at Pomeroy, O. to get into that city, under an unsatisfactory agreement with the city authorities, has finally obtained control of the belt road by lease for a term of 15 years. The lease was made on Sept. 30, and some important improvements are to be at once entered upon, among them the laying of more terminal tracks and construction of a new passenger station and a freight house.

**Columbia River & Astoria.**—This company was incorporated in 1891, but beyond having preliminary surveys made along the Columbia River has not succeeded in doing much work upon the line. It is now reported, however, by one of the officers, that arrangements have been nearly completed for beginning the work north of Portland, Or., and that the contracts will be let during the winter or early in the spring. It is proposed to build along the south bank of the Columbia River from Portland to Astoria, Or., a distance of about 100 miles. The line was surveyed by W. H. Kennedy, of Portland, and some of the right of way secured. Mr. Kennedy is still Chief Engineer, and the chief executive officer is Walter C. Smith, of Portland, Vice-President.

**Delaware & Hudson Canal Co.**—A short branch from near Au Sable, N. Y., to connect with the Saranac & Lake Placid Railroad which was opened this summer, is reported to be building by this company. The work is now going on near Au Sable, the terminus of the branch from Plattsburgh, and the connection with the Saranac & Lake Placid made near Lake Placid, a few miles south.

**Denver & Rio Grande.**—The Ruby branch of this road was opened for traffic Oct. 1. It extends from Crested Butte, Col., west to the Ruby-Anthraxite mines, 11 miles. These mines are owned by the Colorado Fuel & Iron Co., and will ship from 100 to 200 tons of coal daily.

**Drummond County.**—The extension of this road to the town of Levis, opposite Quebec, is being pushed rapidly, and the officers expect to have about 30 miles of the new line built by the end of October. The line to Levis branches off from the present line at St. Leonard station, Que., 48 miles from St. Hyacinthe, and 84 miles from Montreal; it then extends in a straight direction toward Levis, where it will join the Intercolonial railroad system. The road passes through a forest of about 50 miles in length, which is now considered one of the richest timber limits in eastern Canada. When this road is finished it will give the Intercolonial a short connection for Montreal and points south and west. The Drummond County road connects with the Grand Trunk at St. Hyacinthe, and at St. Rosalie and Drummondville with the Canadian Pacific.

Charles Church is President of the company, and W. Mitchell, of Drummondville, P. Que., is General Manager, and A. Ouellette is General Freight and Passenger Agent.

**Elk Mountain.**—A local correspondent says that arrangements are being made in London to place bonds in the sum of \$1,000,000 to finish the road. The line is graded, and with the exception of a few bridges is ready for the rails. It will open extensive coal and marble deposits, besides a fine silver district, between the towns of Carbondale and Marble, Col. Orman & Crooke, of Pueblo, have been the contractors for the work already done, and will probably have the contract to finish the road.

**Excelsior Springs.**—It is announced that the Wabash is to begin the operation of this road early this month. The line was built this year by W. B. Strang, of Kansas City, contractor, from Excelsior Springs, on the Chicago, Milwaukee & St. Paul, south, about 10 miles, through Clay County, Mo., to Missouri City, a town on the Missouri River, where the junction is made with the Wabash. S. F. Scott, of Kansas City, is the President of the local company.

**Florida Central & Peninsular.**—Capt. I. Y. Sage, President of the Southern Supply Co., of Atlanta, which has the contract for building the Savannah extension of this road, reports that the entire construction work will probably be completed within two months. The new road-bed was very seriously damaged by the recent storms. The grade is now being rapidly repaired, but the contractors suffered serious losses. It is said that the track still to be laid to complete the line will be built by the railroad company. The extension is about 115 miles long from a point on the Florida Central & Peninsular west of Jacksonville, Fla., north to Savannah.

**Florence, Cripple Creek & State Line.**—A Boston banker has been looking over the territory to be traversed by the proposed line, and has inspected Cripple Creek with a view to estimating the value of the bonds to be issued by the company, of which W. E. Johnson, of Florence, is President. The line has been surveyed from Florence north to the Cripple Creek mines.

**Georges Valley.**—The contractors have been delayed in completing the construction of this road by meeting with a troublesome sink-hole near Union Village on the northern end of the line. The road is practically ready for operation up to this point, and the filling in which has been required has been expensive and has caused considerable loss of time. No work can be done on the bridge at South Union, about one mile beyond the sink hole, until the track reaches the bridge site. The road is about eight miles long, beginning at Warren Village and extending north to Union, Me.

**Great Northwest Central.**—J. A. Charlebois, of Ottawa, contractor, who constructed this road, states that his claims against the road, amounting to \$700,000, will be heard before the Court of Chancery on Nov. 2. About 50 miles of the road in Manitoba was completed in 1890. The company has been involved in continuous litigation since then. The road is now operated by H. F. Forrest as Receiver.

**Kansas City, Pittsburgh & Gulf.**—The Southern extension of this road has been graded to Siloam Springs, Ark., and it was expected that the track would be laid and the road in operation to that point this week. The company will then have 231 miles of road in operation. The company opened a through line in September from Kansas City to Sulphur Springs, Ark., 206 miles, by building a connection of 25 miles between Pittsburg, Kan., and Joplin, Mo., the northern terminus of the Kansas City, Fort Smith & Southern, which is now controlled by the company. Siloam Springs, to which the line has now been extended, is 25 miles south of Sulphur Springs and on the route toward Fort Smith, Ark., to which it is proposed to extend the road in due time.

**La Porte, Houston & Northern.**—The first shipment of rails for the main line of this road was expected to reach Galveston this week, and the work will be commenced at once at Harrisburgh, near Houston, and the northern terminus of the line. The contract for completing the line has been let to J. F. Allen, a Nebraska contractor, and he has everything in readiness to carry on the work without delay. It is proposed to build the main line from Harrisburgh to La Porte, 22 miles, at once, and then the extension to Clear Creek will be built. Clear Creek is about seven miles beyond La Porte, and the grading and bridging is about completed on the extension as well as on the main line.

**Los Angeles & Pacific.**—John Cross, of Los Angeles, and Charles W. Cross, of San Francisco, filed new articles of incorporation for this company at Los Angeles last week. They propose to revive the project of a steam railroad between the city of Los Angeles and Santa Monica, a port on the Pacific Ocean about 20 miles from the city. The incorporators named were connected with the company which built a railroad to Santa Monica several years ago, but the road has not been in operation for a long time. It was seriously damaged by storms soon after it was opened and never repaired.

**Midland Terminal.**—Negotiations have been resumed to obtain funds for the building of the proposed line from Cripple Creek, Col., to connect with the Colorado Midland, which is already graded for two-thirds of the distance.

**Mississippi River & Leech Lake.**—Under this charter it is proposed to build a line from Little Falls south to St. Cloud, Minn., 30 miles, where it will connect with the Great Northern. The citizens of Little Falls, at a recent public meeting, voted to raise \$100,000 by bonds to aid the enterprise. It will require \$300,000 to complete the line, and it is understood that Peter Musser, President of the Pine Tree Lumber Co., of Little Falls, and Frederick Weyerhaeuser, of St. Paul, who is at the head of a lumber syndicate, will raise the remaining \$200,000.

**Nelson & Fort Shephard.**—Peter Larson, the contractor of this road, now building into British Columbia states that the bridge and trestle work about eight miles from the Pend d'Oreille River on the south end of the line has delayed track-laying, but that from this time on a mile and a half to two miles will be laid each day, as machine track-layers are to be used on the work. The track will reach Nelson, B. C., before Nov. 1. Nelson is the northern terminus, about 90 miles beyond Northport, Wash., the connection with the Spokane Falls & Northern, which controls the new road.

**Nevada Southern.**—This company has since Jan. 1, 1893, laid 31 miles of track, from Blake Station (formerly Goffs) on the Atlantic & Pacific, in San Bernardino County, Cal., to Manvel Station, in the same county, a point about three miles south of the famous gold camp of Vanderbilt. Grading is proceeding between Manvel and Vanderbilt at a moderate pace and the engineers are making a preliminary survey northward into Nevada. It is the purpose of the company to build to Good Springs and to the southern part of Lincoln County, Nev., an additional distance of about 50 miles, at an early date. Financial arrangements are now being perfected to secure that result, although no contracts are in shape to let. The contractors building the first section of the road are Bright & Crandall, of Los Angeles. The Nevada Southern Construction Co. was recently incorporated in Denver with G. C. Manly,

of Denver, as President, and Charles B. Mason as Secretary, for the purpose of constructing the remaining portion of this road. The country developed by the road is one of exceptional resources in gold, silver, lead and copper, and the new line will also open up some very fine agricultural land, which is at present not cultivated owing to its inaccessibility. I. E. Blake, of Denver, is President of the railroad company, and R. F. Burns, of Williams, Ariz., is Chief Engineer.

**New York, New England & Northern.**—The New York State Railroad Commissioners this week announced that they had approved the surveys for this road and had decided to authorize the company to build over the route from Brewsters, N. Y., on the New York & New England south to Leggett's Point on Long Island Sound, a distance of 53 miles. This is the company organized some weeks ago by President McLeod of the New York & New England, to secure a New York City line for that company. Long articles have been published in the New York newspapers, purporting to show the progress with the plans, but no definite statement of the arrangements made to build the line have been given. The officers of the Manhattan company deny any connection with the project.

**Ohio Southern.**—A force of about 200 men has been completing the Lima extension for the last few weeks and the tracklaying reached that city on Oct. 1. The line is now being ballasted and the trains will be put on in a few weeks. It is understood that they will run into the passenger station of the Chicago & Erie at Lima, O. The extension is 69 miles long from Springfield northwest, and the chief traffic will be in carrying coal from the mines in southern Ohio. The directors have announced their purpose of continuing the line beyond Lima toward Toledo and a second survey is being made for that line. McArthur Brothers, of Chicago, who have the contract for building the extension to Lima, have recently begun snit against the company for \$100,000 for work done on the extension.

**Portland & Rumford Falls.**—The work on the extension to connect with the Maine Central at Auburn, Me., which was begun early in the spring, is now so nearly completed that the tracklaying has begun, and it is not likely to be delayed until the rails reach Auburn probably in a few weeks. The extension begins at Mechanics Falls, and extends east to the connection with the Maine Central, near Auburn, 12 miles.

**San Diego & Phoenix.**—The construction work on this road near San Diego, Cal., was stopped recently, but it is now announced that the causes which led to that suspension have been overcome. The right of way difficulties have been adjusted, some changes have been made in the management, and the work is to be resumed at once. So far about 3½ miles of track has been laid from San Diego and some additional grading has been done. W. H. Carlson, Mayor of San Diego, has been elected President of the company in place of D. C. Reed, resigned.

**Sioux Falls, Yankton & Southwestern.**—The track laying through Yankton, S. D., will now be completed at once, agreements having just been made with the officers of the Chicago & Northwestern and the Chicago, Milwaukee & St. Paul regarding the crossings of the tracks of those roads in Yankton by the new line. The rails have been laid close to Yankton and the work will be resumed immediately and the track laid through the city to the station. The local papers state that the Great Northern will operate the road as soon as it is completed. The road has been built by Senator R. F. Pettigrew, of Sioux Falls. It is 60 miles long, extending from Sioux Falls southwest to the Missouri River at Yankton.

**Southern Pacific.**—J. P. Hughes, of Fort Worth, Tex., who has the contract for building the Midland branch of this road, reports that he has built about 14 miles up to the present time, the work having begun in July. His contract is for a line through Acadia Parish, La., for about 21 miles north of the Southern Pacific. The new road branches off from the present line at a point about eight miles west of Crowley, La., and extends through a very rich country, which, however, has no towns of importance. The track-laying is to begin shortly, and the work will probably be finished in November.

**Toledo & Ohio Central.**—The first train over the western division, which has been building between Columbus and Ridgeway, O., all summer, passed over the new line on Sept. 27, the inspection party on board, including President Stevenson Burke, and Vice-President Charles G. Hickox, of Cleveland; General Manager J. M. Ferris, General Superintendent T. F. Whittlesey, Chief Engineer J. M. Williams and T. G. Blair, of New York, of the Board of Directors. All of the division is now ballasted except about six miles, and it is expected to begin the running of regular trains this month. Either the Baltimore & Ohio or Pennsylvania tracks will be used to reach the Columbus Union Station. Work on the terminals at Columbus has begun on land purchased for a roundhouse, yard and other purposes west of the river. Work on the belt line around the city will not be pushed till spring, owing to difficulty in getting the right of way. The company has just made traffic arrangements with the New York, Chicago & St. Louis for Chicago and other West-bound business, which forms a new line from Columbus and Central Ohio to Chicago. The line just completed begins at Ridgeway, near Kenton, and extends southeast through Marysville to Columbus, O., 50 miles.

**Wilmington, Newberne & Norfolk.**—The extension to Newberne, N. C., is now open for regular traffic, and two daily trains are running over the entire road from Wilmington to Newberne, about 83 miles. The extension begins at Jacksonville, the towns of Maysville and Pollockville being the most important intermediate stations. The opening of the line through to Newberne, which is about 33 miles beyond Jacksonville, gives the city of Wilmington railroad connection with a productive section of eastern North Carolina, and which heretofore has had no railroad outlet.

**Williamsport & North Branch.**—The extension of this road from Nordmont, Pa., to connect with the Lehigh Valley has just been opened for traffic. The line is about 18 miles long, extending northeast from Nordmont to Satterfield, a new town a short distance north of Bernice, Pa. The new road has been built with maximum grades of 95 ft. to the mile and with maximum curves of 14 deg. There are only two bridges on the line, 100 and 120 ft. long each. The company has now 36 miles of road in operation between Hall's and Satterfield. The trains run into Williamsport over the Philadelphia & Reading from Hall's. B. G. Welch, of Hughesville, Pa., is General Manager.



## GENERAL RAILROAD NEWS.

**Boston & Albany.**—At the annual meeting of the stockholders in Boston, Sept. 27, it was voted to issue bonds to an amount not exceeding \$5,000,000 at such time and in such manner as the directors may deem best. The rate of interest was also left to the directors. Of the proposed new issue of bonds \$2,000,000 will be used to retire \$2,000,000 seven per cent. bonds maturing Feb. 10, 1895, and it is estimated that \$3,000,000 will be required for construction account between Boston and Springfield. Between these points a large number of bridges have been built, or are now in progress, to carry highways above or below the tracks, and the company is also preparing to extend the third and fourth main tracks westward from Riverside to South Framingham, about 11 miles. Most of the grading for this improvement is already done and the widening of the bridges carrying the tracks over streams is nearly finished. With this extension there will be four tracks from Boston to South Framingham, 22 miles.

**Fitchburg.**—The annual meeting of the stockholders was held at Boston on Sept. 27, and it was voted without opposition to authorize the directors to issue new bonds to the amount of \$2,500,000, the rate of interest to be decided by the directors. About \$500,000 will be required to retire the seven per cent. bonds which mature next April, and the balance is required to refund the floating debt. The expenditures on construction account for the last three years has averaged considerably over \$300,000; the Brookline Railroad, the stock of which is owned by the company, cost \$205,000 and \$390,000 was required to retire the bonds of the branch road which became due last spring. These various expenditures amount to over \$2,300,000.

**Louisville & Nashville.**—The directors, at a meeting in New York City last week, voted to increase the capital stock \$5,000,000, making the outstanding amount \$60,000,000. The officers of the company decline to state the purpose of the new issue beyond what is contained in the resolution passed by the Board of Directors, which is as follows: *Resolved*, That, in view of divers negotiations that are pending, it be recommended to the stockholders to increase the capital stock of this company to the extent of \$5,000,000, making the amount of capital stock \$60,000,000. The Louisville & Nashville has an option on the majority of the stock of the Chesapeake, Ohio & Southwestern, now owned by C. P. Huntington, and it is thought that the new issue may be contemplated to provide for the purchase of this road. A meeting of the stockholders has been called for Nov. 8, at Louisville, to consider the proposition.

**Northern Pacific.**—This week Receivers have been appointed for the various branch lines of the company in all the states through which the road passes. Henry Stanton of New York City, and Alexander McKenzie, of Bismarck, N. D., were appointed Receivers of branch lines in North Dakota, by Judge Thomas, at Fargo, N. D., on Oct. 3. The branch lines included in the order are the Fargo & Southwestern; Northern Pacific; Lamoure & Missouri Valley; James River Valley; Sanborn, Cooperstown & Turtle Mountain; Jamestown & Northern, and Southeastern. The interest on bonds was defaulted Oct. 1.

**Nyack & Northern.**—B. G. Frost was appointed Receiver of this road on Sept. 30, by the State Supreme Court at Brooklyn, but a few days later a stay of proceedings was obtained by the counsel for the Northern Railroad of New Jersey, which operates the road. The chief complaint of the petition for a Receiver was that the officers had allowed the road to be sold by the sheriff under a small judgment and that the stockholders were not protected in the proceedings. The road is only five miles long, reaching Nyack, N. Y.

**Pennsylvania.**—The statement of the business of all lines east of Pittsburgh and Erie for August, 1893, as compared with the same month in 1892, shows a decrease in gross earnings of \$754,630, a decrease in expenses of \$339,340, a decrease in net earnings of \$414,790. The eight months of 1893, as compared with the same period of 1892, show an increase in gross earnings of \$408,709, an increase in expenses of \$708,229, a decrease in net earnings of \$299,520. All lines west of Pittsburgh and Erie for August, 1893, as compared with the same month in 1892, show a decrease in gross earnings of \$546,761, a decrease in expenses of \$316,711, a decrease in net earnings of \$230,050. The eight months of 1893, as compared with the same period of 1892, show an increase in gross earnings of \$157,457, an increase in expenses of \$324,462, a decrease in net earnings of \$167,005.

**Philadelphia & Reading.**—The earnings of the railroad company for August are given in the following table:

	1893.	1892.	Inc. or Dec.
Gross earn.....	\$1,896,225	\$2,022,645	D. \$126,379
Oper. expen.....	1,074,757	1,063,894	I. 5,863
Net earn.....	\$821,509	\$953,751	D. \$132,242
Other income.....	27,739	17,819	I. 9,720
Total.....	\$849,047	\$971,570	D. \$122,522
Equip and rentals.....	94,175	154,097	D. \$59,922
Fixed charges.....	650,000	625,441	I. 24,559
Surplus.....	\$104,872	\$191,632	D. \$86,760

For nine months net earnings decreased \$708,534, and the deficit after charges is \$224,061, against a surplus of \$537,132 a year ago, a loss of \$761,193. The gross earnings of the Coal & Iron Co. decreased \$270,152 in August, and the net earnings decreased \$58,329 over the same month in 1892.

**Sioux City & Northern.**—The report that this road, also the Sioux City, O'Neil & Western and the Sioux City Terminal, has passed into the control of the Great Northern is denied by the officials of the latter road.

Col. W. P. Clough, Vice-President of the Great Northern, said, in regard to the matter, that the Great Northern does not own the properties, and has no intention of acquiring them, and that whatever courtesies had been extended by the Great Northern to these companies were simply friendly offices to the people who own the properties, and are also largely interested in the Great Northern.

The Manhattan Trust Company, of New York, on Sept. 28, made application before Judge Shiras in the United States Circuit Court at Sioux Falls for the appointment of a receiver for this property. The Trust Company alleges that the road has defaulted on its interest on \$2,000,000 of its bonds for which the Trust Company is trustee, and that it is not earning operating expenses. The case was set for hearing on Oct. 3.

**South Jersey.**—Logan M. Bullitt, of Philadelphia, Vice-President and General Manager of the company, announces that the final payment of \$62,500, due the West Jersey Railroad as purchase money, was made on

Sept. 28. Mr. Bullitt says the officials of the company are very well satisfied with the results of the season's business, the road having more than paid operating expenses, and that the prospects for a profitable future are very bright. Arrangements have been perfected for completing the road to Ocean City and Cape May, N. J., from Tuckahoe, in time for next summer's travel. The grading to these points having already been done. It is proposed to lay the road with 70-lb. rails and provide an equipment of 10 engines and 50 passenger cars. When this is done and all paid for, the total issue of outstanding first mortgage bonds will be \$850,000. They will be 30-year five per cent. bonds.

**Southern Pacific.**—The following is the report of earnings for August:

	1893.	1892.	Inc. or Dec.
Gross earnings.....	\$1,017,808	\$1,593,056	D. \$575,248
Oper. expenses.....	2,533,315	2,740,970	D. 207,655
Net earnings.....	\$1,484,493	\$1,832,086	D. \$367,593
Eight months to Aug. 31.			
Gross earnings.....	\$31,183,312	\$30,837,154	I. \$346,158
Oper. expenses.....	20,736,605	20,337,101	I. 399,504
Net earnings.....	\$10,446,707	\$10,500,053	D. \$53,346

**Wisconsin Central.**—Receivers were appointed for the company by Judge Jenkins, of the United States Court at Milwaukee, last week. Henry F. Whitcomb, General Manager, and Howard Morris, of Milwaukee, Counsel of the company, were named as the Receivers. It was stated in the order that they were to have no jurisdiction or authority over the Chicago & Northern Pacific. The petition for the appointment of Receivers was made by President E. H. Abbot and John A. Stewart, who complained that more than \$500,000 was due the company as rentals from the Northern Pacific, which it was unable to collect from the Receivers of the latter company, who had also set up a counter claim for \$1,000,000. President Abbot says that the Receivership will preserve the system intact, and prevent any default on the bonds.

## TRAFFIC.

## Traffic Notes.

The fare between New York and Boston by the Fall River steamers has been reduced from \$4 to \$3.

The Northern Pacific has put on the through passenger train taken off Sept. 3, so that there are now two through trains each way daily.

The Pittsburgh & Lake Erie has made a reduction of about 20 per cent. in round trip passenger rates between local stations.

The Missouri, Kansas & Texas took 6,818 passengers into Galveston on Sept. 23 and 24, said to be the largest excursion that was ever carried in Texas.

The Southern Passenger Association has decided that all tickets hereafter issued by the roads in the Association must be time-limited.

The Chamber of Commerce, of Cleveland, O., is taking steps toward the establishment of a freight bureau, with an experienced railroad traffic man for commissioner.

The Pennsylvania has run its last free excursion to Chicago for employees. There have been 10 of these, running weekly since July 29, and the total number of passengers carried was 7,782. All the trains were composed wholly of day cars.

The trunk lines all report a continuance of heavy passenger travel to and from Chicago. The half-fare excursions are as large as ever, and the regular travel keeps the sleeping cars all very busy. On Saturday last the Pennsylvania ran the Chicago limited westward in three sections and the Columbian express in six sections, taking about 4,000 passengers to Chicago that day.

The United States Circuit Court of Appeals of St. Paul has issued a decision sustaining the decision of Judge Riner in the United States Circuit Court in Kansas in declaring the Trans-Missouri Freight Association a legal organization. The District Attorney sued to have the Association annulled as being in violation of the Interstate Commerce law and of the Anti-Trust law. The decision in the Court of Appeals is by Judge Sanborn, Judge Thayer concurring and Judge Shiras dissenting. Judge Riner's decision was reported in the *Railroad Gazette* of Dec. 2 and Dec. 9, 1892.

The movement of cattle from the ranges in North Dakota and Montana was light until about the fifth of September. This was on account of the low prices which prevailed up to that time. Since the advance in the price of cattle at Chicago there has been a considerable increase in the shipments. The largest number of car loads passing Minnesota Transfer in one day was on Sept. 24, when 305 cars of cattle were forwarded to Chicago.

M. M. O'Donnell, ticket agent of the Michigan Central at Windsor, Ont., was arrested at Chicago this week while attempting to sell tickets to scalpers. When he was searched \$640 worth of Michigan Central tickets were found on his person. The ticket office in Windsor was burned recently, and it was reported that thousands of dollars worth of tickets were destroyed. While another office was being built O'Donnell obtained permission to visit Chicago to see the Fair.

The receipts of flour and grain by lake at Buffalo from the opening of the season to Oct. 1 have been a little larger than last year, and much larger than ever before, as shown by the following table:

	Flour, barrels.	All grain, bushels.	Flour and grain, bushels.
1893.....	6,516,861	92,509,377	125,093,682
1892.....	6,391,910	90,967,000	121,328,572
1891.....	4,608,188	79,786,619	101,675,450
1890.....	4,370,221	63,003,756	83,695,274

A despatch from Topeka, Kan., states that W. W. Webb, a ticket broker, was arrested on Sept. 29 on a warrant sworn out by Assistant General Passenger Agent Black, of the Atchison, Topeka & Santa Fe, charging him with using a Santa Fe extension stamp containing the name of George T. Nicholson, General Passenger Agent. When the sheriff made a search of Webb's office he found not only a Santa Fe stamp, but also one bearing the name of John Sebastian, General Passenger Agent of the Rock Island. That company will also prosecute him for forgery. Webb's wife furnished bonds in the sum of \$3,000.

The through passenger traffic over the Southern Pacific for August was as follows:

	First class.	Second class.	Total.
Eastward.....	3,425	3,757	7,182
Westward.....	3,523	4,205	7,630
	6,750	7,962	14,812

In August, 1892, the number westbound was 7,116 and eastbound 5,457. For the first eight months of the year the totals compare as follows:

	1892.	1893.
Westward.....	61,451	59,463
Eastward.....	47,042	58,059

There has been a decrease of 2,000 in the number of arrivals in California and an increase of 11,000 in the number of departures therefrom this year as against last year. The World's Fair accounts for the increased number of departures, but it is not clear why it should cause a decrease in arrivals.

## Chicago Traffic Matters.

CHICAGO, Ill., Oct. 4, 1893.

The future course of the Wisconsin Central is causing considerable speculation here. As regards its terminals here, there are some who think it will throw up the lease of the Chicago & Northern Pacific on the same grounds that the Northern Pacific receivers dropped the lease of the Wisconsin Central, viz., as being too burdensome. If this is done, arrangements for terminal facilities may be made with some other line. As regards association membership the Wisconsin Central takes the ground that it is not a member of any of the associations, holding that the membership formerly held by the "Wisconsin Central Lines" terminated on Sept. 26, and that neither the Wisconsin Central Company, nor the Wisconsin Central Railroad ever signed any articles of agreement. Receiver and General Manager Whitcomb declares, however, that the policy of the road will be conservative.

The generally granted passenger rate for Oct. 9, "Chicago Day" at the World's Fair, over the Eastern roads is one cent a mile for all distances within 150 miles or less of Chicago, and about 1½ cents for distances over this. Western lines have agreed to grant half fare from all points where the standard one-way rate is \$6 or less; 80 per cent. of the round trip rate from all points where the rate is over \$6 and less than \$23; 75 per cent. from points where the rate is over \$23 and less than \$33; 70 per cent. from points where the rate is over \$33.

The Central Traffic and Western Freight associations are endeavoring to reach a uniform system for billing lumber. The Western roads bill without specifying the number of pieces or feet in a carload, while Central Traffic rules require such specification. The latter Association now asks the Western lines to amend their rules to conform to the rules of the Eastern lines.

Texas rates are again demoralized by the action of the Southern Pacific in making reductions from St. Louis and Chicago on agricultural implements, claiming that competing lines have been secretly quoting the rates which it now makes openly, viz., 50 cents per 100 lbs. in agricultural implements from St. Louis to Texas points. Other commodities are involved.

It is announced that the Sioux City & Northern proposes to take into court the question of the right of the Western Passenger Association to refuse to honor its tickets on the ground that it was demoralizing rates.

The Rock Island is charged with paying excessive commissions on Utah business, which it denies. Chairman Caldwell has also ruled that the excessive commissions now being paid on California business are in violation of the rules, and the roads convicted are liable to forfeiture of the commissions and the payment of a fine.

The Alton denies the authority of Chairman Caldwell to rule that no association line can take individual action in accepting, basing and selling rates from connecting lines.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending Sept. 30 amounted to 51,750 tons, against 48,306 tons during the preceding week, an increase of 3,444 tons, and against 42,284 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Sept. 30.		W'k to Sept. 23.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	4,688	9.0	5,652	11.7
Wabash.....	3,111	6.0	3,516	7.3
Lake Shore & Michigan South.....	9,243	17.9	7,976	16.5
Pitts., Ft. Wayne & Chicago.....	5,507	10.8	4,693	9.7
Pitts., Cin. Chicago & St. Louis.....	6,655	12.8	7,180	14.9
Baltimore & Ohio.....	2,663	5.2	3,231	6.7
Chicago & Grand Trunk.....	3,689	7.2	3,348	7.3
New York, Chic. & St. Louis.....	6,557	12.7	5,306	11.
Chicago & Erie.....	6,807	13.1	5,070	10.5
C., C. & St. Louis.....	2,770	5.3	2,134	4.4
Totals.....	51,750	100.0	48,306	100.0

Of the above shipments 1,248 tons were flour, 17,971 tons grain and millstuff, 9,744 tons cured meats, 12,355 tons dressed beef, 1,171 tons butter, 1,552 tons hides and 3,661 tons lumber. The three Vanderbilt lines carried 39.6 per cent., the two Pennsylvania lines 23.6 per cent. The Lake lines carried 11,774 tons, against 112,839 tons during the preceding week, an increase of 5,635 tons.

(Other Chicago traffic news will be found on page 737.)

## Westbound Trunk Line Passenger Traffic.

The following figures, which seem to have come from the Trunk Line Commissioner's office, have been printed in the New York *Herald*. They probably show the number of westbound passengers from New York to and beyond Buffalo, Pittsburgh, etc. There are some small errors in the percentages:

Month of August:	Day Car excursions.		Total excursion.		Regular travel.	
	No.	P. c.	No.	P. c.	No.	P. c.
N. Y. C. & H. R.....	704	13.1	1,169	8.9	4,925	56.8
West Shore.....	749	12.7	2,018	15.5	216	2.5
N. Y., Ont. & W.....	802	13.6	1,476	11.2	33	0.4
N. Y., L. E. & W.....	1,161	19.7	2,519	19.1	653	7.5
Del., Lack. & W.....	750	12.7	1,608	12.2	84	0.1
Lehigh Valley.....	733	12.5	1,436	10.7	183	2.1
Penn.....	370	6.3	739	5.6	2,060	23.8
Balt. & Ohio.....	532	9.4	1,806	14.4	497	5.7
	5,892		13,187		8,856	

April 21 to Sept. 1:

	Day car excursions.		Total passengers.		Allotted per centage.	
	No.	P. c.	No.	P. c.		
N. Y. C. & H. R.....	900	12.5	25,797	35.4	33.0	
West Shore.....	851	11.8	6,475	8.9	6.0	
N. Y., Ont. & W.....	1,262	17.6	4,622	6.3	3.0	
N. Y., L. E. & W.....	1,288	19.7	6,760	9.2	15.0	
Del., Lack. & W.....	940	13.1	5,571	7.6	5.5	
Lehigh Valley.....	788	11.1	4,435	6.1	3.0	
Penn.....	471	6.0	12,027	16.6	25.0	
Balt. & Ohio.....	680	9.5	6,411	8.8	9.5	
Ches. & Ohio.....			856	1.2	....	
			7,180	72.954	100.0	